Detectives and Superheroes: A Pilot Study Teaching Flexible Thinking in Social Situations to a Child with High Functioning Autism

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Abstract

Complex social-cognitive deficits are common in individuals diagnosed with high functioning autism and Asperger syndrome. Research on effective and evidence-based social interventions is needed for this population. This study focused specifically on the challenges these individuals face with respect to flexible thinking and related flexible behaviour in social situations. Madrigal and Winner's (2008) Superflex curriculum targets social flexibility, however at the time of this study no published research had been conducted to determine the effectiveness of this approach. This study was a pilot study, which sought to examine the impact of the Superflex curriculum within a 10-week training program in teaching one individual with high functioning autism how to think and behave flexibly in social situations. Multiple measurement tools were utilized, and analyses within and across the measures revealed inconsistencies, especially with respect to generalization. Although preliminary, this study provided valuable information for subsequent research.

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Chapter 1: Introduction

Autism spectrum disorder (ASD) is an umbrella term that is often used to describe a group of pervasive developmental disorders (PDDs) with a neurological and genetic etiology. The fourth edition, text revision of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR; American Psychiatric Association [APA], 2000), which is the current diagnostic system used by developmental pediatricians, psychiatrists and psychologists, outlines the diagnostic criteria for five PDDs, which include Autistic Disorder (AD), Asperger Syndrome (AS), Rett's Disorder, Childhood Disintegrative Disorder, and Pervasive Developmental Disorder - Not Otherwise Specified (PDD-NOS). All individuals diagnosed with ASD have some degree of impairment in the areas of communication, social interaction, and behaviour; however the severity of impairment varies considerably from one person to the next, and these individuals can display a broad range of challenges and abilities.

Often terms such as "classic" and "high-functioning" are utilized to categorize the degree of symptom severity in ASD. Individuals with AD or classic autism exhibit more severe impairments and are intellectually disabled; whereas individuals with high-functioning autism (HFA) fall within the typical range of intelligence, with IQ scores above 70 (Weiss & Harris, 2001; Winner, 2002). Individuals with HFA and AS share many symptoms and characteristics, and often researchers and clinicians do not distinguish between these two disorders (Camarena & Sarigiani, 2009). In fact, in the forthcoming edition of the DSM, which is to be published in 2013, it has been proposed

that AS be removed as a diagnostic category and instead three levels of ASD severity will be distinguished based on level of support needed (APA, 2010).

A core feature of ASD is significant impairments in social functioning, and complex social-cognitive deficits are particularly apparent in individuals diagnosed with HFA and AS (Bellini, Peters, Benner, & Hopf, 2007; Wicks-Nelson & Israel, 2006; Winner, 2002). Social impairments hinder all aspects of development and lead to a variety of detrimental short-term and long-term outcomes, including peer rejection, social isolation, and depression (Bellini et al., 2007). As such, it is important to identify interventions for individuals with ASD, and more specifically for individuals with HFA and AS, which lead to measurable gains in social functioning.

Flexible thinking is crucial for the development of social functioning. Flexible thinking refers to the "mental flexibility of [the] brain to interpret verbal and nonverbal information based on different points of view or different contexts" (Madrigal & Winner, 2008, p. 13). Limited mental flexibility is a commonly cited social-cognitive deficit exhibited by individuals with HFA and AS (Cotugno, 2009; Winner, 2007). Despite this, inflexible thinking and interventions targeting inflexible thinking in individuals with HFA and AS have not been adequately addressed in research literature.

Based on the need for social interventions that address flexible thinking, Madrigal and Winner (2008) developed *Superflex: A Superhero Social Thinking Curriculum*. The purpose of the Superflex® curriculum and supplementary materials is to help children with social-cognitive challenges develop a greater awareness of the inflexibility of their own thinking in social situations, and to provide them with social-cognitive strategies to modify their thoughts and actions (Madrigal & Winner, 2008). This curriculum is based

on the broad-scale Social Thinking® intervention approach (Winner, 2008b), and both the Social Thinking and Superflex curricula have been widely implemented in clinical settings and schools. However, to-date, no research has been conducted on the Superflex lessons and materials. As such, despite the potential usefulness, it is unclear whether training using this curriculum results in significant increases in flexible thinking and flexible social behaviour within natural social situations, particularly in individuals with HFA and AS.

Chapter 2: Literature Review

Social Deficits and Related Outcomes in Individuals with HFA and AS

Unlike individuals with classic autism, individuals with HFA and AS do not exhibit marked difficulties with expressive language, intelligence or adaptive behaviour (Rao, Beidel, & Murray, 2008; Wicks-Nelson & Israel, 2006). They do, however, have deficits in their ability to use language appropriately, particularly within the area of social exchanges (Winner, 2002). Individuals with HFA and AS exhibit considerable qualitative impairments in social interactions, and they have restricted and unusual patterns of interest (Rao et al., 2008; Wicks-Nelson & Israel, 2006). Specific social skill deficits characteristic of HFA and AS include: difficulty with initiating and regulating social interactions (Barry et al., 2003; Rao et al., 2008); problems with perspective taking and social reciprocity (Attwood, 2000; Rao et al., 2008); failure to adequately use and interpret nonverbal social cues, such as eye gaze, facial expressions, body posture and gestures (Barry et al., 2003; Rao et al., 2008); lack of empathy and failure to behave in ways that are emotionally appropriate (Attwood, 2000; Rao et al., 2008); and difficulty with social pragmatics, sarcasm and metaphors (Cotugno, 2009; White, Keonig, & Scahill, 2007).

It is crucial that individuals with HFA and AS receive appropriate training so that they are able to compensate for challenges in social functioning, as these impairments hinder social relatedness and academic success, and lead to a variety of detrimental outcomes (Bellini et al., 2007; MacKay, Knott, & Dunlop, 2007). In terms of social relatedness, these individuals have difficulty forming peer relationships that are meaningful or age-appropriate, and friendships are often of poor quality or non-existent

(Bellini et al., 2007; Cotugno, 2009; Whitehouse, Durkin, Jaquet, & Ziatas, 2009). As well, the social deficits characteristic of HFA and AS are associated with rejection and bullying by peers, loneliness, and social isolation (Bellini et al., 2007, Tse, Strulovitch, Tagalakis, Meng, & Fombonne, 2007; Whitehouse et al., 2009). Bauminger and Kasari (2000) examined loneliness and friendship in 22 children diagnosed with HFA, compared to 19 typically developing children. The participants with HFA and the typically developing participants were matched on age, IQ scores, gender, ethnicity and mother's education, and no significant differences in demographic variables were found between the two groups. The participants completed the Loneliness Rating Scale and the Friendship Qualities Scale. Compared to the typically developing participants, the participants with HFA reported greater feelings of loneliness, and their friendships were of poorer quality on the subscales of companionship, security/trust and help. Further, the results suggested that the participants with HFA had a poorer understanding of the relation between loneliness and friendship.

Impaired social functioning in children and adolescents with HFA and AS has also been connected to poor performance at school and academic underachievement (Bellini et al., 2007; Myles, 2005; White et al., 2007). According to Winner (2008a; personal communication, September 16, 2010), it is possible that this is due to the fact that these students' lack of social understanding impacts their ability to engage in many academic tasks, including reading comprehension, written expression, and effectively working in peer-based groups.

The consequences of exhibiting social deficits are heightened once individuals with HFA and AS reach adolescence (White et al., 2007). This is due to the fact that at

this stage of development where social interactions are becoming more complex, many of these individuals experience a greater desire to form friendships and yet are becoming more aware of their social incompetence (Tse et al., 2007; White et al., 2007). According to Contugno (2009), due to the social challenges faced, many individuals with HFA and AS avoid social contact, and they experience over-arousal and stress in social situations. Numerous researchers have reported that the presence of social impairments in adolescents and adults with HFA and AS can lead to low self-esteem, depression, anxiety disorders, defiance, and in severe cases, aggression and suicidal ideation (Bellini et al., 2007; Gutstein & Whitney, 2002; Tantam, 2003; Tse et al., 2007).

Furthermore, social deficits in individuals with HFA and AS are associated with additional negative outcomes in adulthood. Adults with HFA and AS are often unemployed, and those who do hold jobs frequently experience barriers to workplace opportunities and advancement due to their lack of social competence (Gutstein & Whitney, 2002; Tse et al., 2007). Adults with HFA and AS are less likely to engage in social activities, be involved in significant relationships, or get married (Gutstein & Whitney, 2002; MacKay et al., 2007). As illustrated by the short- and long-term outcomes highlighted, the social deficits exhibited by individuals with HFA and AS have a continual impact on development and quality of life. As such, these individuals require effective social intervention, which starts early in childhood and continues through the lifespan.

Intervention Research and Best Practice

In developing an intervention program, it is important to refer to research to ensure that the highest quality instruction is being used. Evidence-Based Practice (EBP)

refers to intervention models and methods that are grounded in scientific research (Odom et al., 2005; Wang & Spillane, 2009). Ideally, this research should be conducted before the intervention is widely implemented. Examining intervention research allows for greater understanding of which behaviours are probable to change, for whom the intervention works best, and under what conditions the intervention should be implemented for best possible results. Scientific research is needed before it can be determined whether an intervention is beneficial, including whether it results in measurable cognitive, behavioural, emotional and/or social gains. Interventions that are not evidence-based but do have some research support warrant additional research. These interventions may be used in practice, with caution, and they should involve ongoing evaluation at the individual level to ensure a positive impact. Interventions unsupported by research may be beneficial, however, without quality research, the extent of the potential benefit is unknown. As well, without research it is unknown whether these practices involve harmful side effects. Research determining whether an intervention is an EBP is important, as it is detrimental to waste time, resources and funds on interventions that are ineffective.

Several organizations, professional associations and researchers have set forth standards for describing and evaluating research (Odom et al., 2005; Wang & Spillane, 2009). Despite minor differences among these sources, generally accepted criteria have been established for determining whether an intervention is an EBP (Chambless & Hollon, 1998; Odom et al., 2005; Wang & Spillane, 2009). In brief, in order for an intervention to be considered evidence-based, there must be at least two experimental group research studies or three to five single-subject research studies. The studies must

examine similar subject populations, and have been conducted by different researchers. Further, the studies must be of high quality, employing sound research designs that demonstrate strong experimental control. For group research, experimental control is achieved through a comparison or no-treatment group and randomized group selection; for single-subject research, strong experimental control is achieved through complex phase changes, such as in reversal, multiple-baseline or alternating treatments designs. The studies must also utilize multiple reliable and valid outcome measures, and appropriate data analysis with sufficient statistical power. Finally, to demonstrate-effectiveness, positive results must be obtained consistently across the studies. Often review papers and meta-analyses, which involve the re-analysis of data from several related research studies, are conducted to identify the overall effectiveness of an intervention approach.

Social Interventions

Various interventions have been employed to foster social development in individuals with ASD (Rogers, 2000; Wang & Spillane, 2009). Commonly employed interventions include discrete trial training and intensive behaviour therapy, social skills training groups, video modeling, Social Stories™, peer-mediated strategies, cognitive behavioural training, self-management, and parent training (Rogers, 2000; Weiss & Harris, 2001; Wang & Spillane, 2009). Some research evidence exists which suggests that many of these interventions result in positive gains in targeted social skills, however, reviews indicate varying levels of improvement (Reichow & Volkmar, 2010; White et al., 2007). Research has indicated that a major limitation of social interventions for individuals with ASD is limited generalization of targeted skills from the intervention

setting to natural environments (Barry et al., 2003; Gresham, Sugai, & Horner, 2001; Matson, Matson, & Rivet, 2007). Further, descriptive research review papers have identified inconsistencies in research methodology, target behaviours and outcome measurement, both within and across these interventions, therefore making it difficult to draw conclusions on the overall effectiveness of each intervention (Matson et al., 2007; Reichow & Volkmar, 2010; White et al., 2007).

Wang and Spillane (2009) conducted a meta-analysis of research studies on social interventions for children and adolescents with ASD, with the intention of evaluating whether identified interventions met criteria for being an EBP. Thirty-eight studies published between 1997 and 2008 were selected, and in total there were 147 participants ranging from 2 to 17 years of age. From the 38 studies, five intervention categories were identified: Social Stories, peer-mediated, video modeling, cognitive behavioural training, and other. Set criteria was identified to determine whether each intervention is an EBP, and, depending on research design, the effect size or percentage of non-overlapping data points (PND) was computed for each study to analyze intervention effects.

According to Wang and Spillane (2009), the results of the analysis indicated that only video modeling met criteria for being an EBP and demonstrated high effectiveness as in intervention based on PND scores (11 studies, mean 84.25%, range 50% to 100%). Further, the results indicated that both Social Stories and peer-mediated interventions could potentially be evidence-based, however these interventions demonstrated questionable effectiveness based on PND scores (six studies, mean 67.21%, range 46.7% to 100%; nine studies, mean 60.69%, range 35.09% to 100%, respectively). With respect to cognitive behavioural training, the effect sizes of two studies (ranging from 0.59 to

0.24, and from 1.24 to 0.47, respectively) and PND score of one study (100%) indicated moderate to high effectiveness, however due to the limited number of research studies this intervention did not yet met criteria to be considered an EBP. Finally, within the other category there were eight different interventions, each with only one or two research studies, and as such, despite potentially effective PND scores these interventions were not evidence-based.

The findings of the meta-analysis conducted by Wang and Spillane (2009) are consistent with additional meta-analyses and descriptive review papers on video – modeling (Bellini & Akullian, 2007; Reichow & Volkmar, 2010; Scattone, 2007), Social Stories (Kokina & Kern, 2010; Reynhout & Carter, 2006; Scattone, 2007), and peer-mediated strategies (Chan et al., 2009; DiSalvo & Oswald, 2002; Weiss & Harris, 2001). Overall, despite a growing body of research literature on social interventions for individuals with ASD, only video modeling can be considered an EBP. The majority of social interventions for individuals with ASD commonly used in clinical and educational settings lack rigorous scientific research and as such, cannot be considered EBP (Wang & Spillane, 2009).

Social interventions for individuals with HFA and AS. Many of the social interventions that individuals with HFA and AS receive in research and clinical settings were primarily developed for those from the broader ASD population (Rao et al., 2008). Little research has been conducted on social intervention methods designed specifically for individuals with HFA and AS (Attwood, 2000; Bauminger, 2002; Rao et al., 2008). Moreover, often research studies on social interventions do not report the symptom severity of participants with ASD, and therefore it cannot be determined whether the

intervention is effective for individuals with AD, or for individuals with HFA and AS. This is a major limitation of social intervention research for this population. Due to differing levels of impairment and abilities across the ASD population, as well as differing social deficits and strengths, social interventions need to be tailored to meet the individual needs of the client, including specifically whether the client has been diagnosed with AD, or with HFA and AS (Rao et al., 2008). In particular, in order for the intervention to be appropriate and potentially effective, instruction should match the cognitive and language skills of the target client (Rao et al., 2008).

Schreiber (2011) conducted an in-depth descriptive review of research studies to address the need for evidence-based social interventions specifically targeting individuals with HFA and AS. Thirty-eight studies published between 2001 and 2009 were selected for the review, and seven categories of social interventions were identified: Social Stories, manualized instructional programs, non-manualized training and support groups, cognitive behaviour therapy, parent- or family-mediated, peer-mediated, and activity-based. Although the findings of many of the research studies were positive, not enough high-quality research had been conducted on any individual intervention model or method that was included in the review, and as such none of the interventions could be considered EBP (Schreiber, 2011).

Skill-Based Social Interventions versus Social-Cognitive Interventions

Many of the social interventions highlighted in the previous section are skill-based, targeting specific social skills within a behavioural or social learning framework (Matson et al., 2007). For example, intensive behaviour therapy and social skills training groups often promote skill acquisition by manipulating environmental variables using

techniques from applied behaviour analysis (ABA), such as reinforcement, shaping, chaining, prompting and fading. Although a large body of research literature has demonstrated that ABA is an EBP, the majority of research studies on social interventions that utilize ABA methods and techniques (for example, social skills training groups) do not include individuals with HFA or AS (Rao et al., 2008; Schreiber, 2011). Further, the results of the few research studies on these interventions that do include individuals with HFA and AS provide only minimal support for the effectiveness of the intervention (Rao et al., 2008).

Social interventions for individuals with HFA and AS that utilize a social-cognitive framework appear to be a promising addendum to skill-based methods. Social cognition refers to the process through which individuals respond to social information by acquiring, understanding and using social knowledge (Crooke, Hendrix, & Rachman, 2008). According to proponents of social-cognitive interventions, skill-based interventions are limited because "the emphasis is often towards the production of social skills in the absence of additional instruction on the social thinking that supports these skills" (Winner, 2008a, p. 8). It is often assumed that individuals with HFA and AS already possess the underlying social knowledge necessary to understand discrete instruction on isolated skills. However, according to Winner (2008a), this may not be the case, and as such, skill-based social interventions may not be sufficient for addressing the complex social challenges these individuals encounter.

According to Winner (2002), the specific social impairments exhibited by individuals with HFA and AS are behavioural manifestations of core, underlying social-cognitive deficits. These social-cognitive deficits include underdeveloped theory of mind

and perspective taking abilities; problems in processing social information, including interpreting social rules and subtle social nuances; difficulties with emotion regulation and understanding; weak central coherence, including difficulty with concept formation and recognizing the whole picture; attention difficulties; and deficits in executive function, including limited mental flexibility, and poor impulse control, planning and problem solving skills (Barry et al., 2003; Bauminger, 2002, 2007a; Myles, 2005; Stichter et al., 2010; Winner, 2008a). Therefore, individuals with HFA and AS may be better suited to receive social interventions that target these social-cognitive deficits and provide direct instruction on underlying social-cognitive processes, rather than targeting isolated social skills.

A number of research studies have begun to emerge on interventions that utilize a social-cognitive framework to address a variety of social deficits common in individuals with HFA and AS. Such targets have included theory of mind (Gevers, Clifford, Mager, & Boer, 2006; Ozonoff & Miller, 1995; Solomon, Goodlin-Jones, & Anders, 2004; Stichter et al., 2010); joint attention (Cotugno, 2009); facial expression recognition (Solomon et al., 2004; Stichter et al., 2010); emotional understanding (Bauminger, 2002, 2007a, 2007b); anxiety in social situations (Cotugno, 2009); and executive functioning (Stichter et al., 2010), including social flexibility (Cotugno, 2009) and problem solving (Bauminger, 2002, 2007a, 2007b; Solomon et al., 2004; Stichter et al., 2010). Overall, the results of these studies are favourable, as they suggest that the participants demonstrated significant improvements on measures of social cognition, as well as on measures of global social functioning.

Despite positive findings, the conclusions that can be drawn from the existing research on social-cognitive interventions are limited due to reoccurring methodological weaknesses. These weaknesses include poor experimental design and control, poor measurement tools and assessment procedures, and limited generalizability. Further, although all of these studies take on a social-cognitive framework, they employ different intervention procedures, and not enough research has been conducted on any single procedure. Therefore, while promising, social-cognitive interventions cannot yet be considered EBP.

Social Thinking

Social Thinking is a broad-scale social-cognitive intervention. Developed by speech-language pathologist Michelle Garcia Winner, this approach targets individuals with social-cognitive difficulties, including those diagnosed with HFA, AS, PDD-NOS, attention-deficit hyperactivity disorder, and nonverbal learning disorder (Winner, 2008b). Social Thinking stems from literature on child development and cognitive behaviour therapy, as well as from Winner's clinical experience (Winner, 2008b). The objective of Social Thinking is to help individuals with social challenges develop a greater understanding of underlying social-cognitive processes that are necessary to successfully develop social skills and engage in social interactions (Crooke et al., 2008; Winner, 2008a). Lessons within the Social Thinking curriculum address elements of problem solving, perspective taking, social communication, understanding social expectations, and self-monitoring (Winner, 2008b). Social Thinking promotes social awareness, drawing attention to *why* it is important to employ social skills within different contexts and social exchanges (Crooke et al., 2008; Winner, 2008b), and the approach encourages individuals

to "think socially before acting socially" (Winner, 2008a, p. 112). Within this intervention approach, it is expected that once individuals with social-cognitive difficulties are provided with instruction on Social Thinking, this social awareness will translate to changes in related social behaviour (Winner, 2008a).

Winner and colleagues have published curriculum manuals on Social Thinking, as well as a number of supplementary resource guides, teaching tools and comic books. Winner frequently speaks at conferences to parents and professionals about Social Thinking, and she has received a Special Congressional Recognition Award for her work in the field (Think Social Publishing, 2008). Furthermore, Winner has stated that she has applied the Social Thinking intervention approach successfully in her clinical practice for over 10 years, as clients have reportedly demonstrated positive gains in social cognition and related social skills (M. G. Winner, personal communication, September 16, 2010). According to Winner, Social Thinking has also been implemented in many private clinics and school boards across North America (M. G. Winner, personal communication, September 16, 2010).

Research studies on Social Thinking. Although Social Thinking appears to be a promising social intervention, scientific research on its effectiveness is limited, and it cannot be considered an EBP. Thus far, only two preliminary studies have been published which evaluate Social Thinking (Crooke et al., 2008; Lee et al., 2009). Crooke and colleagues have conducted a research study using a single-subject multiple baseline design to examine the Social Thinking curriculum; however the full study has not been published (Crooke et al., 2008; P. J. Crooke, personal communication, July 21, 2010). Instead, Crooke et al. (2008) published a brief report, which provided a preliminary

analysis of pre-training to post-training data collected from the study. The participants were six males between the ages of 9 and 11, who met the diagnostic criteria for HFA or AS and had a verbal IQ within the average range (85-115). The specific IQ scores of each participant were not provided. The participants attended group training sessions, as well as four interspersed generalization sessions in a second location. The training sessions consisted of lessons focused on teaching social-cognitive strategies for understanding and regulating social thoughts, taken from the first edition of Winner's (2008b) curriculum, *Think Social!* The dependent variables were categorized as expected behaviours and unexpected behaviours related to engaging in a social exchange. More specifically, expected behaviours were verbal and nonverbal behaviours that served to initiate or sustain a social exchange, whereas unexpected behaviours were verbal and nonverbal behaviours that served to be inappropriate or distracting within a social exchange. The frequency of these behaviours was measured through direct observations of social exchanges within the generalization sessions in the non-training setting.

For the brief report, Crooke et al. (2008) selected observation data from the first baseline session and the last generalization session for pre-post data analysis. A Wilcoxon signed-rank test was used to analyze pre-post group data, and the results revealed significant changes in the frequency of the expected behaviours and unexpected behaviours. Further, visual inspection of individual participant data revealed pre-post increases in verbal and nonverbal expected behaviours for all six participants, as well as pre-post decreases in verbal unexpected behaviours for four of the participants and in nonverbal unexpected behaviours for five of the participants. According to Crooke et al., results of the brief report provide preliminary data to support the effectiveness and

generalizability of Social Thinking as a social-cognitive intervention for individuals with HFA and AS.

Lee et al. (2009) conducted a case series to investigate the effectiveness of a group-based Social Thinking training program implemented in Hong Kong. The participants were four males, aged 14 to 15, who met the diagnostic criteria for HFA. Of these participants, one had an IQ in the below average range, two participants had an IQ in the normal range, and one had an IQ in the above average range. The specific IQ scores or the score ranges were not provided. The content of the training program was based on Winner's (2007, 2008b) Social Thinking curriculum and resources. The program focused on improving social communicative functioning, and the training sessions consisted of role-play activities, discussion, videos and games. Following each training session, the participants and their parents were given homework and vocabulary sheets to review at home to further their understanding of the material.

Lee et al. (2009) measured participant progress pre-training to post-training using the Social Thinking Rating Scale (STRS), a tool that Lee et al. developed based on the progress report used in Winner's clinical practice. The participants' parents, teachers and social workers completed the STRS, and for each participant the informants' scores were combined to obtain a mean rating. Comparison of pre-post scores revealed that all four participants experienced slight improvements on the STRS, however the magnitude of improvement was very small, ranging from 0.88% to 7.54%. Lee et al. also measured participant progress through pre-post interviews with the participants and their parents. Qualitative analysis was used to examine the interviews, and the post-training transcripts revealed perceived improvements for all four participants in social understanding and

social behaviour outside of the training setting. Lee et al. reported that the participants learned how to think socially, which translated into meaningful changes in their social behaviour, including increased conversations with others, a greater awareness of body language in social situations, and improvements in the quality of relationships.

According to Crooke et al. (2008) and Lee et al. (2009), their research findings provide evidence that a training program utilizing the Social Thinking principles, curriculum and resources may be effective in addressing targeted social-cognitive abilities and related social behaviour in individuals with HFA and AS. However, there are a number of methodological weaknesses within these two studies, and given that these are the only studies published to-date on the Social Thinking curriculum, there are limits as to what can be concluded with respect to the overall effectiveness of Social Thinking as a social intervention.

Although the results of both studies were favourable, only pre-training to post-training data were reported, and no experimental controls were employed. A pre-post design does not allow the researchers to clearly identify a causal relationship between implementation of the intervention and participant outcomes (Hayes, Barlow, & Nelson-Gray, 1999). Without a control condition or a more complex single-subject design, conclusions cannot be drawn regarding whether changes in social functioning were the result of the intervention, or if such changes were due to maturation or other extraneous variables (Hayes et al., 1999). As such, the findings of Crooke et al.'s brief report and Lee et al.'s case series must be interpreted with caution until additional research is conducted that addresses these limitations. Overall, more research studies are needed before definitive conclusions can be made regarding whether the Social Thinking

intervention approach results in beneficial changes in social understanding and social behaviour for the targeted populations, including individuals with HFA and AS.

Social Interventions and Generalization Issues

Generalization refers to "the occurrence of relevant behaviour under different, non-training conditions (i.e. across subjects, settings, people, behaviours, and/or time) without the scheduling of the same events in those conditions as had been scheduled in the training conditions" (Stokes & Baer, 1977, p. 350). Overall, social interventions for individuals with ASD have been criticized for having limited generalizability (Barry et al., 2003; Gresham et al., 2001). This is true for both skill-based and social-cognitive interventions, as well as for social interventions targeting individuals across the broad ASD population. This criticism is partly due to the fact that social interventions often fail to adequately program for generalization (Gresham et al., 2001; Stokes & Baer, 1977). According to Stokes and Baer (1977), it should not be assumed that generalization occurs naturally. Several researchers have highlighted the importance of explicitly programming for generalization when designing an intervention, including the need to embed multiple generalization strategies into the intervention procedures (Griffiths, Feldman, & Tough, 1997; Openden, Whalen, Cernich, & Vaupel, 2009; Stokes & Baer, 1977). Griffiths et al. (1997) investigated the effects of programming for generalization within a game-based social skills training program for adults with developmental disabilities. Based on the results of the study, Griffiths et al. suggested that there is a "positive relationship between the number of generalization strategies employed and the generalized effects of social skills training" (p. 266).

Further, social interventions for individuals with ASD have been criticized for having limited generalizability because most of the existing research studies have failed to adequately measure generalization (Gresham et al., 2001). Ideally, generalization effects should be measured through direct observations, conducted as unobtrusively as possible, in different settings and with different people (Crooke et al., 2008). This type of measurement allows the researcher to directly document and assess meaningful changes in behaviour, rather than relying on informant-data.

Generalization in Social Thinking. Generalization is an area of particular interest within the Social Thinking intervention approach. According to Winner (2008a, 2008b), providing individuals with social concepts and strategies to think about, as opposed to teaching them how to perform social skills, increases the likelihood that the individuals will naturally apply the newfound social awareness to novel situations. As such, it is expected that these individuals will learn to think socially in natural environments, and that their increased ability to think socially will lead to increases in related socially appropriate behaviours (Winner, 2008a, 2008b). The Social Thinking approach does not explicitly train specific social skills; however, it does expect generalization to occur, from talking about social behaviour within a training context to behaving socially within a natural social context. The only aspect of Social Thinking that can be seen to actively promote generalization involves teaching parents and teachers about the Social Thinking concepts and vocabulary terms, and encouraging parents and teachers to discuss these concepts and their application to real social situations with their children and students.

The preliminary research on Social Thinking conducted by Crooke et al. (2008) and Lee et al. (2009) provide some support for Winner's (2008a, 2008b) claims that generalization from thinking socially to engaging in social behaviours occurs naturally following Social Thinking training. Crooke et al. did not explicitly incorporate strategies to promote generalization from the training setting to the non-training setting; however, they did attempt to measure generalization through direct observations in the non-training setting. Pre- to post-training observations revealed that the participants demonstrated significant changes in the frequency of expected and unexpected behaviours in the second setting. Therefore, the results of the study indicated that generalization occurred: after acquiring underlying knowledge about social exchanges in the training sessions, participants were then able to demonstrate gains in social exchanges in the non-training setting. Given that the same peers and adults were present in both settings, this can be seen as a proximal measure of generalization. It is impossible to state whether the results would have been the same if the participants were observed with different peers and adults found in more natural environments, demonstrating a more distal measure of generalization.

Similarly, in the study conducted by Lee et al. (2009), participant and parent interview data indicated that generalization to the natural environment occurred, and that the newfound social knowledge generalized to new social behaviours. However, this evidence of generalization is weak, given that no direct observation data were collected to corroborate informant reports. The results of these two studies (Crooke et al., 2008; Lee et al., 2009) provide some evidence to suggest that the social-cognitive concepts taught within the Social Thinking training sessions generalized to performance of related social

behaviours within contrived and natural social settings. However, the methodological limitations of these studies make it difficult to draw conclusions on the generalizability of the Social Thinking intervention approach.

Flexible Thinking

Flexible thinking can be seen as a foundational starting point for all social-cognitive behaviours. In addition to interpreting social information based on a given context, flexible thinking involves the shifting of thoughts and actions when faced with context changes (Madrigal & Winner, 2008; Pijnacker et al., 2009). An individual is said to possess strong social skills when he or she is able to be flexible and effectively adapt to others across a variety of social contexts (Winner, 2007). Based on the principles of Social Thinking, an individual must possess underlying social knowledge and be a strong social thinker before he or she can adapt to others effectively. Due to the fact that social rules vary considerably across contexts, and that most social interactions involve fluid and variable exchanges, an individual must be able to think and behave flexibly within social situations in order to be successful in the social world (Madrigal & Winner, 2008; Myles, 2005; Winner, 2008a).

Flexible thinking is a considerable area of concern for most individuals with HFA and AS (Bauminger, 2007a; Cotugno, 2009; Liss et al., 2001; Pijnacker et al., 2009; Stichter et al., 2010). Most individuals with HFA and AS display rigid and inflexible ways of thinking, and they often become "stuck" within these patterns of thinking (Cotugno, 2009; Gately, 2008). Furthermore, these individuals frequently experience tension and stress when they must attempt to adjust their thinking, resulting in anxiety and "meltdowns" (Cotugno, 2009). Despite recognition that inflexible thinking in

individuals with HFA and AS may be associated with a number of social deficits, as well as age-inappropriate behaviours, this area has not been adequately addressed in the research literature.

Superflex and the Team of Unthinkables

Based on the need for social interventions that concentrate on flexible thinking, Madrigal and Winner (2008) developed *Superflex: A Superhero Social Thinking Curriculum*. This curriculum was derived from the broader principles of Social Thinking, and from Madrigal and Winner's clinical experience. This model makes use of lessons, comic books and handouts about a superhero named Superflex and a group of opponents, the Team of Unthinkables, to teach flexible thinking to children with social-cognitive challenges, including those diagnosed with HFA and AS. Superflex is a flexible thinker, and his strengths encompass elements of perspective taking and problem solving. The Team of Unthinkables is comprised of 14 characters that are "not-so-flexible" thinkers; each character has a distinct "power" over the brain that leads to different undesirable social behaviours (Madrigal & Winner, 2008).

The purpose of this curriculum and the supplementary materials is to help individuals with social-cognitive difficulties develop a greater awareness of the flexibility or inflexibility of their own thinking within social situations. As well, the curriculum provides these individuals with social-cognitive strategies, referred to as Superflex Strategies, to help them modify their thoughts and actions (Madrigal & Winner, 2008). The core premise of the curriculum is that all individuals are superheroes in training, not just those with social-cognitive challenges, and that each individual is faced with his or her own Team of Unthinkables to overcome (Madrigal & Winner, 2008). Through

learning about the adventures of Superflex, each individual can minimize the power of his or her Unthinkables by learning how to use the Superflex Strategies to shift his or her thinking and behaviour (Madrigal & Winner, 2008).

Research on Superflex and the Team of Unthinkables. According to Madrigal and Winner (2008), development of the Superflex curriculum was practice-driven. To-date, no research has been published on the curriculum lessons and the supplementary materials, yet this teaching approach has been implemented in clinical settings and schools (KATU News, 2008; M. G. Winner, personal communication, September 17, 2010). Without research studies conducted using adequate experimental design and control, it is unclear whether this curriculum produces beneficial gains in flexible thinking and flexible behaviour across social situations within natural environments, especially for individuals with HFA and AS. Despite a lack of research evidence on the effectiveness of this approach, the superhero theme of the materials appears to be appealing to the children it targets (M. G. Winner, personal communication, September 17, 2010).

Superheroes in culture and therapy. Since the 1930s children and adolescents have been exposed to superheroes in comic books, and over decades this exposure has spread to other mediums, including action figures and related merchandise, television, movies, and computer and video games (Anderson & Cavallaro, 2002; Martin, 2007). According to Anderson and Cavallaro (2002), superheroes represent "larger-than-life" symbols of western values. Superheroes portray a variety of cultural messages, and they often reinforce stereotypes related to gender, race and ethnicity, and disability (Anderson & Cavallaro, 2002; Martin, 2007).

Children are fascinated by superheroes, as well as by the archenemies superheroes must defeat (Martin, 2007). Children often engage in superhero play, where they assume the roles of their favourite characters (Anderson & Cavallaro, 2002; Bauer & Dettore, 1997). According to Bauer and Dettore (1997), superheroes, and superhero play, are appealing to children for four reasons: first, superheroes possess power and extraordinary strength; second, through superhero play children are able to "try out" different personalities; third, superhero play provides a release from built-up tension and frustration; and fourth, superheroes engage in vigorous physical activity. Overall, children recognize that it is fun to be a superhero (Livesay, 2007).

Researchers have argued that superheroes can foster children's development of morality, higher-level cognitive skills (including attention to detail, sequencing, problem-solving and decision-making), self-esteem, self-regulation, interpersonal communication skills, cooperation and teamwork skills, conflict resolution, and creativity (Bauer & Dettore, 1997; Enfield, 2007; Martin, 2007). Further, due to the widespread exposure and popularity of superheroes, children may be receptive to the idea of using superhero themes within intervention settings (Nelson, 2007). Based on a number of case studies, superheroes have been utilized effectively as an instructional tool with a variety of populations in clinical practice within the areas of counseling, psychotherapy and play therapy (Rubin, 2007b). Although the methods used in these fields are different from those used in the Superflex curriculum, these case studies demonstrate that superheroes can be employed as a vehicle to facilitate discussion and to explore personal, complex and abstract subject matter (Rubin, 2007a).

Chapter 3: Purpose of the Current Study

The current research study sought to investigate whether participation in a social-cognitive training program based on the Superflex curriculum (Madrigal & Winner, 2008) had a beneficial impact on the development of social cognition and related social behaviours in a child with HFA or AS. More specifically, this study explored the usefulness of the training program in teaching the individual how to think and behave flexibly in social situations. The purposes of this study were: (a) to examine whether a child with HFA or AS demonstrated improvements in flexible thinking as a result of participating in the training program, and (b) to examine whether the child demonstrated changes in flexible social behaviour within the natural environment as a result of participating in the training program.

Rationale

It was expected that the current research study would contribute meaningfully to the growing body of literature on HFA and AS, particularly with respect to the areas of flexible thinking, social functioning and social intervention. As suggested in the literature, it is crucial that individuals with HFA and AS receive social interventions targeting specific social-cognitive deficits and mental inflexibility. Additionally, due to the complex nature of the social challenges individuals with HFA and AS face, it is recommended that the interventions these individuals receive utilize a social-cognitive framework. Further, it is important to identify social interventions that are evidence-based, which lead to measurable gains in social functioning in individuals with HFA and AS.

Social Thinking and the Superflex teaching approach appeared to have potential in addressing the social-cognitive deficits exhibited by individuals with HFA and AS. However, due to the limited number of research studies and the methodological weaknesses of the research published to-date, it was unclear whether training using these curricula and supplementary materials was effective in increasing social-cognitive ability and related socially appropriate behaviour within naturally occurring social contexts. As such, more research was needed in this area. Due to the breadth of Social Thinking, it would not have been feasible to adequately evaluate an application of all of the curricula and materials within a Master's thesis. As such, the current research study had a more narrow focus. Assessing the effectiveness of the Superflex curriculum in teaching flexible thinking to an individual with HFA or AS was a focused means for validating one aspect of Social Thinking. Social awareness training, based on the broader Social Thinking curriculum, was included to provide prerequisite knowledge for instruction on Superflex.

Overall, the primary objective of a social intervention is generalization, as the intervention is of little value if clients do not experience improvement in their ability to engage in social interaction in real-life social situations (Griffiths et al., 1997). The current study aimed to examine whether natural generalization occurred as a result of receiving training using the Superflex curriculum and materials. Further, the results of this study would provide evidence to support or dispute Winner's (2008a, 2008b) claims that teaching Social Thinking concepts and strategies transfer to increases in social awareness and related social behaviours in the natural environment.

Finally, the current research study was significant because it was a pilot study for future research on the Social Thinking and Superflex curricula and materials with

individuals with HFA and AS. The thesis supervisor intends on conducting additional studies to further examine this intervention, and the procedures and the results of this study will be used to guide the direction of said research. Ultimately, research validation of this intervention warrants the use of experimental designs, such as multiple baseline designs across participants or between-group comparison studies.

Research Questions and Hypotheses

The research questions and hypotheses of the current study were:

1. What would be the effect of a training program focused on teaching flexible thinking, using Madrigal and Winner's (2008) Superflex curriculum, on the development of flexible thinking within the training setting and on the generalization to flexible social behaviour within a non-training setting, in a child with HFA or AS?
    a. While participating in the training program, the participant would show measurable gains in flexible thinking within the training setting, as evidenced in direct observation of the participant's use of statements related to the vocabulary terms, concepts and strategies taught in the training program.
    b. While participating in the training program, the participant would engage in progressively more target expected behaviours and progressively fewer target unexpected behaviours within probes in the non-training setting, compared to baseline, as evidenced in direct observation of the participant while interacting with a familiar peer or sibling.
    c. While participating in the training program, the participant would engage in more flexible behaviour in naturally occurring social situations and the

quality of the participant's flexible behaviour would improve, as evidenced in weekly parent reports, and in pre-training and post-training interviews with the participant, the participant's parent, and the familiar peer or sibling.

2. What if the training program were to not lead to meaningful changes in target behaviours in the child following seven weeks of participation in the training program? What effect would the addition of a behavioural contingency plan in the subsequent three weeks of the training program have on the child's development of flexible thinking and flexible social behaviour?

    a. Despite increases in statements related to the training material (hypothesis 1.a), and gradual changes observed in target expected and unexpected behaviours while participating in the training program (hypothesis 1.b), the changes would not be meaningful until the behavioural contingency plan was added to the training program.

Chapter 4: Method

Participants

Primary participant. One participant was selected for this pilot study as the primary participant, based on the following inclusion criteria: (a) chronological age between 8 and 10 years old, (b) formal diagnosis of HFA or AS by a developmental pediatrician, psychiatrist or psychologist based on the DSM-IV-TR (APA, 2000), as confirmed by a diagnostic report, (c) full scale and verbal comprehension IQ score of 80 or above on the Wechsler Intelligence Scale for Children (WISC-IV; Wechsler, 2003), as confirmed by the results of an assessment administered within the past six months or a short form assessment administered by the research team, (d) no identified conduct problems, and (e) not currently enrolled in a social intervention program.

Steven (pseudonym) was 10 years and 8 months old at the start of this study. He was diagnosed with HFA at the age of 3 years and 6 months by a child psychiatrist. Following the consent procedure, Steven's IQ was assessed using a short form WISC-IV. His estimate full scale IQ score was 82 and his estimate verbal comprehension IQ score was 83, both of which fall into the low-average range. Throughout the duration of the study Steven's mother reported that he was not enrolled in any other intervention programs. With the exception of Melatonin that was taken at night to aid with a sleep disturbance, Steven was not on any medications, which remained consistent throughout this study.

With respect to demographic variables, Steven was a Caucasian male from an intact nuclear family. Steven lived with both parents and his younger sister, Sarah (pseudonym). Steven's mother completed college and his father completed high school.

Both of Steven's parents worked full-time, and total family income before taxes was reported as more than $95,000. Steven was enrolled in a mainstream grade five classroom, and he had an Individualized Education Plan (IEP) and received support from a classroom educational assistant as needed. Overall, Steven was a bright and energetic child, however his mother reported that he often had difficulty with social interactions, particularly related to being flexible when playing with Sarah.

Peer or sibling participant. To be selected for this study the primary participant was required to have a familiar peer or a sibling agree to participate. Peers could include neighbors, classmates, family friends or cousins. The peer or sibling was to be about the same age as the primary participant, preferably within two years of the primary participant's age.

Steven's mother decided that it would be most beneficial if Sarah were the participant, as opposed to a peer. Although hesitant initially, due to concerns about being videotaped and getting in trouble, Sarah agreed to participate. Sarah was 8 years and 10 months old at the start of this study. Sarah's mother reported that she had some learning challenges, however they were not associated with ASD. She had a pleasant personality and was very talkative. Sarah reportedly enjoyed spending time with her brother, and often would accommodate his inflexibility.

Researchers

The research team was comprised of the investigator and the thesis supervisor. The investigator was a graduate student from the Centre of Applied Disability Studies (CADS), and she had 10 years of experience interacting with children with developmental disabilities, including those with ASD. The thesis supervisor was an

Associate Professor and the Clinical Coordinator for CADS. She was a registered psychologist with over 30 years of clinical experience working with children with developmental disabilities, including ASD. She had completed the three-day Social Thinking Mentor Training program at Winner's Social Thinking Center in San Jose, CA.

Additionally, a research assistant (RA) was involved in this study, however she did not administer the assessments nor implement the training program. The RA was a fourth year undergraduate student from the Faculty of Social Sciences. The RA served as a second observer to collect data on inter-observer agreement (IOA) following considerable training on how to identify and code the target behaviours. Further, she collected data on treatment integrity and transcribed the interviews.

Setting

The intake and pre-training assessments, and the training sessions took place in a family interview room in the Jack and Nora Walker Canadian Centre for Lifespan Development Research building, located on the main campus of Brock University. The room was medium in size and contained a round table and several chairs, as well as the materials brought in by the research team for the training sessions. The probe sessions, the post-training assessments, and the follow-up probe session took place in Steven's home, which was in the St. Catharines region. The home was a single dwelling two-story house, and the sessions were carried out in the family room for the majority of the time, and the kitchen, dining room and basement were also used.

Target Behaviours

The dependent variables were flexible thinking and related flexible behaviour. Due to the fairly abstract nature of these concepts, acquisition target behaviours were

selected to measure flexible thinking, and generalization target behaviours were selected to measure flexible behaviour.

Acquisition target behaviours. Six verbal behaviours were selected by the investigator to measure Steven's acquisition of the training material. More specifically, these verbal behaviours were selected to gauge Steven's ability to use the language directly taught within the training sessions regarding how to think flexibly. The acquisition targets were coded as prompted statements or spontaneous statements. A statement was considered prompted when it followed a direct question or a "fill-in-the-blank" style comment, or when Steven was asked to generate examples of behaviours, situations or strategies. A statement was considered spontaneous when it was not the response to a prompted question or comment, or when Steven engaged in back-and-forth conversation without using imitation. The acquisition target behaviours can be reviewed in Table 1.

Table 1. Acquisition target behaviours.

	Statements about:
1	Another person's perspective (i.e. the person's thoughts and feelings) E.g. "Sam thinks I am mean because I did not share with him"; asked "how does that make Sam feel?" and responding "sad"
2	Subject's own perspective (i.e. his or her thoughts and feelings) E.g. "I feel happy because John wants to play with me"; asked "what thoughts did you have about John?" and responding "he is a good friend"
3	Situations / behaviours that are expected (good thoughts) and / or unexpected (weird / uncomfortable thoughts), without using the vocabulary terms; include when responding "yes" or "no" to a question (as long as the response is correct) E.g. "sharing with a friend"; "touching people you do not know"; asked "is touching people unexpected?" and responding "yes"
4	Social thinking vocabulary terms E.g. expected behaviour, unexpected behaviour; good thought, weird / uncomfortable thought; brain / body part (or not part) of the group, brain / body rolled out of (or in) the group; thinking with your eyes; smart guess, wacky guess; social detective tools; etc. *exclude when using vocabulary terms related to Superflex and the team of Unthinkables (e.g. Superflexible strategy; Mean Jean)
5	Superflex and the Team of Unthinkables (related to behaviour, social situations, and / or connections to the characters) E.g. "I need Superflex's help to defeat Rock Brain!"; "I have a lot of the Unthinkables in my brain"; asked "which Unthinkable is your Team Leader?" and responding "D.O.F." *exclude when reading from a card, handout or book, and general statements about the characters (e.g. "Superflex's cape is blue")
6	Superflex Strategies to be more flexible and solve social problems (can identify own strategies, do not have to be the ones taught); include when identify what he could have done to be more like Superflex when talking about an Unthinkable moment E.g. "to defeat Glassman I have to identify the size of the problem and use self-talk"; asked "what strategy would you use to defeat Space Invader?" and responding "the one-arm rule" *exclude when reading from a card, handout or book

Generalization target behaviours. Similar to the study on Social Thinking conducted by Crooke et al. (2008), expected and unexpected behaviours were selected to measure Steven's flexible behaviour in social situations in the non-training setting. These targets served as a measure of generalization, as Steven was taught how to think flexibly within the training sessions and the expected and unexpected behaviours were used to determine whether he was then able to change his behaviour to be more flexible when interacting with his sibling. The expected and unexpected targets were initially identified by the investigator based on the literature on flexible thinking and social deficits–exhibited in HFA and AS. The targets were then modified to reflect Steven's specific issues with flexibility in social situations, based on parent report and initial observations.

With respect to the expected behaviours, four verbal targets and two nonverbal targets were selected which related to instances in a social exchange where Steven demonstrated flexibility and the ability to adapt to another person and different contexts. With respect to the unexpected behaviours, four verbal targets and seven nonverbal targets were selected which related to instances in a social exchange where Steven demonstrated inflexibility and insistence on following a rigid pattern of behaviour. The generalization target behaviours can be reviewed in Table 2 (expected behaviours) and Table 3 (unexpected behaviours).

Table 2. Generalization target behaviours – expected behaviours.

Type	Target / Definition
Verbal	Any instance of verbal output in a social exchange that demonstrates flexibility and the ability to adapt to other people and different contexts
	(1) Engaging comments: remarks directed at another person during an activity that are topic-related and appropriate, which demonstrate interest or enthusiasm for the activity or person, and/or encouragement of the person (e.g. "I think you are going to win"); does not include on-task comments (e.g. counting spaces on the game board, reading game cards out loud, making guesses, etc.)
	(2) Compromise comments: remarks directed at another person related to negotiating which activity to engage in, in an attempt to come to an agreement with the person
	(3) Compliance statements: remarks that serve to acknowledge following directives ("do this," rules, instructions) given by another person
	(4) Self-correction comments: remarks that demonstrate an attempt to apologize to another person or to redirect back to the current activity after engaging in an unexpected behaviour
Nonverbal	Any instance of nonverbal/physical behaviour in a social exchange that demonstrates flexibility and the ability to adapt to other people and different contexts
	(1) Compliance behaviours: actions that demonstrate following directives ("do this," rules, instructions) given by another person (e.g. cleaning up or putting away the activity when told; following directions in an activity)
	(2) Self-correction behaviours: actions that demonstrate an attempt to redirect back to the current activity after engaging in an unexpected behaviour

Table 3. Generalization target behaviours – unexpected behaviours.

Type	Target / Definition
Verbal	Any instance of verbal output in a social exchange that demonstrates inflexibility, and insistence on following a rigid way of engaging in a social interaction
	(1) Control comments: remarks that serve to control the actions or comments of another person, or to control the activity; insistence on doing things a specific way
	(2) Refusal comments: remarks related to not wanting to cooperate, take turns or participate in an activity; remarks related to not complying with directives; threats to quit an activity or leave the table/room/etc.
	(3) Rude comments: remarks directed to another person or activity that could readily be identified as offensive to another person or could result in hurt feelings; arguing; remarks that are "snappy," abrupt, and impatient in nature (e.g. "Gosh, you're taking too long, hurry up!")
	(4) Grunting, angry vocalizations, yelling (comments that are of excessive volume for the context)
Nonverbal	Any instance of nonverbal/physical behaviour in a social exchange that demonstrates inflexibility, and insistence on following a rigid way of engaging in a social interaction
	(1) Rude facial expressions: facial expressions directed at another person which are inappropriate (e.g. mocking another person) or angry in nature
	(2) Interrupting turn-taking: not taking turns, or physically preventing another person from having a turn while engaging in an activity
	(3) Cheating: breaking the rules when engaging in an activity to gain an advantage over the other person (including rolling dice again if does not like the roll); misleading or deceiving another person
	(4) Non-compliance behaviours: actions that are in opposition to directives ("do this," rules, instructions) given by another person (e.g. continuing to engage in current activity following instructions to switch activities); ignoring another person
	(5) Destructive behaviours: misusing, throwing or destroying activity materials (excluding tossing dice lightly to the other person)
	(6) Aggressive behaviours: physical threats (e.g. shaking fist) or physical contact with another person with the intention to harm (e.g. hitting, grabbing, wrestling, etc.)
	(7) Quitting/leaving: giving up or stopping an activity before the activity is finished; removing self from the activity space (e.g. going to another area in the room, going to another room)

Measures

Wechsler Intelligence Scale for Children (WISC-IV). The WISC-IV (Wechsler, 2003) is an individually administered standardized intelligence test and a clinical tool that is utilized to evaluate the cognitive ability of children that are 6 years and 0 months to 16 years and 11 months of age. The full scale WISC-IV is comprised of ten subtests, which assess four domains of intelligence: verbal comprehension, perceptual reasoning, working memory, and processing speed. Further, composite scores can be obtained by examining the subtests within each domain. Often for research screening purposes a short form WISC-IV is used to obtain an estimate IQ score (Minshew, Turner, & Goldstein, 2005). Short forms involve different combinations of subtests from the full scale battery, and the selection of specific subtests is based on research that has examined the validity of the short form as a correlate of the full scale (Minshew et al., 2005). The psychometric properties of the full scale WISC-IV and a number of short form combinations have been established, including using children and adolescents with ASD (Minshew et al., 2005; Sattler, 2008).

To ensure that Steven met the IQ inclusion criteria a short form WISC-IV was administered, which included the following five subtests: Matrix Reasoning, Symbol Search, Similarities, Vocabulary, and Information. The first four subtests listed were combined to obtain an estimate full scale IQ score, and the last three subtests listed were combined to obtain an estimate verbal comprehension IQ score. These short form combinations were selected based on the recommendations of Sattler (2008).

Demographics questionnaire. Steven's mother completed a demographics questionnaire (refer to Appendix A). The questionnaire was used to obtain basic

information about Steven and his family. The following information was collected: Steven's ethnicity and date of birth, medications and supplements taken by Steven (including dosage and reason), marital status of primary caregiver, mother's and father's level of education and occupation, and total family income before taxes.

Direct observation. Data were collected on the acquisition and generalization target behaviours through direct observation. Each session over the duration of this study was videotaped in its entirety for later coding and data analysis. The videotape of each training session was coded using event recording for the frequency of the acquisition target behaviours, as well as whether the target was prompted or spontaneous (refer to Appendix B for the observation recording sheet). Further, the videotape of each baseline, probe, post-training probe and follow-up probe session was coded for the frequency of the generalization target behaviours using 15-second partial interval recording (refer to Appendix C for the observation recording sheet). The percentage of 15-second intervals with expected behaviours and unexpected behaviours were calculated to avoid issues related to varying session lengths (i.e. the number of intervals in each session).

Videotaping procedures. All of the baseline, training, probe, post-training probe, and follow-up sessions were videotaped. Steven and Sarah were aware that they were being videotaped, and the camera was set up on a tripod in the corner of the room as unobtrusively as possible. Unlike Crooke et al. (2008), who selected two 15-minute segments of each videotaped session to code and only reported the data from the first baseline session and the last probe session, in this study every session was coded from beginning to end and reported in the results section.

Inter-observer agreement (IOA). IOA was assessed for both the acquisition target behaviours and the generalization target behaviours. Total count IOA was calculated by dividing the number of agreements within the session by the number of agreements plus disagreements and multiplying by 100 (Cooper, Heron, & Heward, 2007). According to Cooper et al., no criterion has been set as a standard acceptable level of IOA, however a minimum of 80% has often been utilized in behavioural research. Further, for the simultaneous measurement of multiple behaviours within a complex environment IOA as low as 75% may be considered acceptable (Cooper et al., 2007).

With respect to the acquisition targets, IOA was assessed on 30% of the training session videotapes. The sessions were selected randomly across phase two and three of the training program. The sessions from the first phase of the training program were not included because they were used when training the RA. The RA independently coded the videotapes and was blind to the phase of the selected sessions, as well as to the session number within the training program. Due to the nature of the acquisition targets, IOA was first calculated for the overall total frequency coded within the session. Mean IOA for the overall total frequency was 87.06% (ranged from 71.79% to 95.16%). IOA was then calculated for the total frequency of the prompted statements and the total frequency of the spontaneous statements within the session. Mean IOA for the prompted statements was 90.94% (ranged from 84.84% to 100%); mean IOA for the spontaneous statements was 44.47% (ranged from 21.42% to 72%).

With respect to the generalization targets, IOA was assessed on 33% of the baseline, probe, post-training probe and follow-up session videotapes. The sessions were selected randomly across the six phases of the research design (one session from the

baseline sessions, one probe session from each of the three training phases, and one session from the post-training or follow-up probe sessions). The RA independently coded the videotapes and was blind to the phase from which the sessions were selected. Due to the nature of the generalization target behaviours and the recording system used, IOA was calculated on an interval-by-interval basis for each of the four target categories within the session. Mean IOA for the expected verbal category was 89.30% (ranged from 86.60% to 96.55%). Mean IOA for the expected nonverbal category was 98.31% (ranged from 96.55% to 100%). Mean IOA for the unexpected verbal category was 83.39% (ranged from 79.57% to 87.06%). Mean IOA for the unexpected nonverbal category was 90.43% (ranged from 83.62% to 96.81%). All disagreements were discussed until consensus on coding was achieved.

Parent reports. Steven's mother completed two weekly parent report forms starting after the pre-training assessments were completed, which continued until the post-training assessments were administered (refer to Appendix D). The first report gathered qualitative information on the occurrence of social interactions in the natural environment in which Steven was flexible and inflexible in his thinking and behaviour. Further, the report included six questions on flexibility in different contexts, which were rated on a 5-point Likert scale. Secondly, Steven's mother completed a recording form on the occurrence of four types of significant upsets and inflexibility. The investigator composed both report forms. Each week the Steven's mother was provided with blank report forms, which were collected the following week.

Interviews. Steven and Steven's mother each took part in an interview prior to starting the training program. The Steven's mother was present during his interview,

however he was not present or within listening distance during his mother's interview. Further, Steven, and his mother and sister took part in separate interviews after the training program was complete. Each interview was 15 to 30 minutes in length. Open-ended questions written by the investigator were posed to guide the interviews, and the discussion centered around Steven's social challenges, his level of difficulty with flexible thinking and related flexible behaviour in different social contexts, and overall perceptions of the effectiveness of the training program (refer to Appendix E for the pre-training and post-training interview questions). The interviews were videotaped and transcribed verbatim. The transcription process involved playing back the videotape several times in order to ensure exact wording.

Social Responsiveness Scale (SRS). Steven's mother completed the parent version of the SRS (Constantino & Gruber, 2005) before he started the training program, and again following completion of the training. The SRS is an informant-based questionnaire (including a parent version and a teacher version) that is utilized to evaluate the social competence of children that are 4 years 0 months to 18 years and 11 months of age. The SRS is comprised of 65 items that are rated on a 4-point Likert scale, and it takes approximately 15 minutes to complete. The SRS was designed specifically to assess individuals with ASD and as such, it is sensitive to symptom severity. Of the 65 items, 35 items relate specifically to the DSM-IV criteria for PDDs.

Analysis of the SRS involves looking at the total score, as well as at five treatment subscales. Overall, higher scores reported on the SRS indicate a greater severity of impairment in social competence (Constantino & Gruber, 2005). The SRS total raw score can range from 1 to 195. The SRS total raw score can also be reported by its

corresponding *T*-score ($M = 50$, $SD = 10$). Three cut-off points have been provided for interpreting the total *T*-score (Constantino & Gruber, 2005). Total *T*-scores of 76 or higher fall within the severe range, indicating deficiencies in reciprocal social behaviour that are clinically significant and that result in severe interference in daily social interactions. Total *T*-scores of 60 to 75 fall within the mild to moderate range, indicating deficiencies in reciprocal social behaviour that are clinically significant and that result in mild to moderate interference in daily social interactions. Total *T*-scores of 59 or lower fall within the normal range, typically suggesting the absence of an autism spectrum condition, and any psychosocial dysfunction noted is more likely to be due to a non-autism related condition. Further, the standard error of measurement (*SEM*) is utilized in interpreting the SRS total *T*-score, as it takes into account variability by providing an estimate of how widely the score tends to vary above or below the obtained result (Constantino & Gruber, 2005). The *SEM* is based on the reliability statistics on the SRS and *SEM* scores are reported in the SRS manual. The *SEM* for interpreting the total *T*-score in clinical assessments is 2.1. The interval provided when examining the *SEM* relates to the normal curve, and as such, interpretations based on two *SEMs* result in more conservative findings and greater confidence that the true score falls within the interval (Constantino & Gruber, 2005). As such, analysis in this study was based on two *SEMs*, which is 4.2.

The treatment subscales were developed to aid in clinical applications of the SRS, and include Social Awareness, Social Cognition, Social Communication, Social Motivation, and Autistic Mannerisms. Analysis of the treatment subscale scores should not be interpreted based on the criterion cut-off points used for the total SRS score

(Constantino & Gruber, 2005). The *T*-scores and the associated *SEMs* for each subscale are to be used to measure treatment effectiveness. For this level of interpretation, the *SEM* is utilized as a means of determining whether any change between *T*-scores from one time of testing to the next reflects a significant effect (Constantino & Gruber, 2005). Again, two *SEMs* were used in this study to increase the confidence of the results on the effects of each treatment subscale.

The SRS has undergone extensive research, including studies on standardization and psychometrics (Constantino & Gruber, 2005). Standardization of the SRS was based on a sample of over 1,600 children, aged 4 to 18, from the general population (Constantino & Gruber, 2005). Five studies contributed to this sample, and based on these studies separate norms were established for parent raters and teacher raters, as well as for male children and female children within each rater type (Constantino & Gruber, 2005). Numerous studies have been conducted to assess the reliability and validity of the SRS. Results of studies examining internal consistency, construct temporal stability, and interrater agreement are all well within the acceptable range (Constantino & Gruber, 2005). Further, validation studies indicate that the SRS has strong discriminant validity and concurrent validity (Constantino & Gruber, 2005).

Treatment integrity. To ensure that the training sessions were implemented correctly, including the lesson plans from the Social Thinking and Superflex curricula, an outline was created for each session. The outline consisted of a list of procedural steps to be completed within the session, as well as a list of steps to be completed within the lesson plan(s) for that particular session. Additionally, the outline included a detailed description of the primary content to be addressed within each step. The outline was

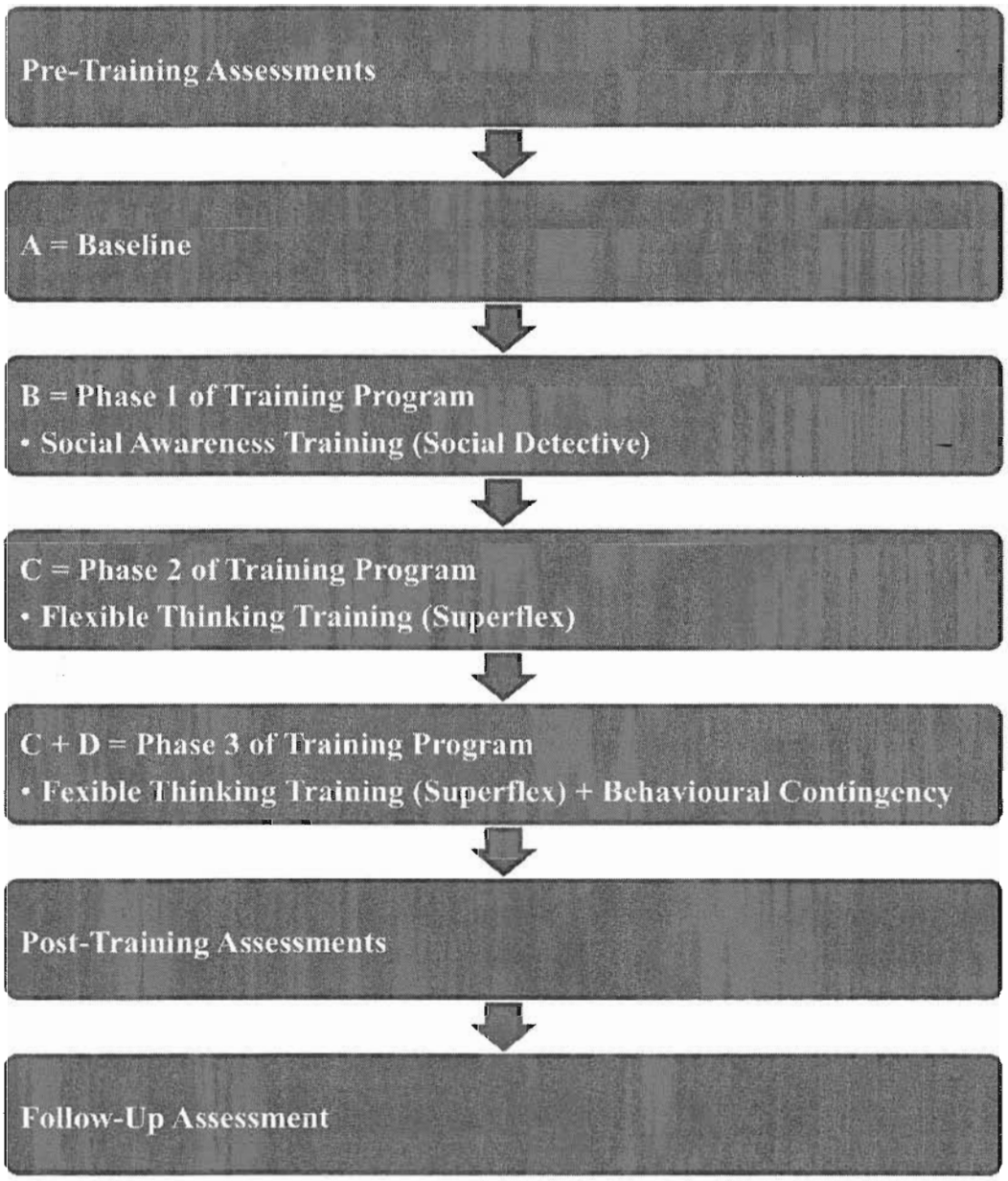
accessible to the research team during the training session, and was referred to periodically to ensure adherence.

Furthermore, treatment integrity was assessed on 40% of the training sessions, to ascertain the extent to which the outlines were followed. For each session the RA was provided with the outline, with the session number omitted, and the RA watched the session videotape independently to verify that the research team addressed each step within the outline. Treatment integrity was calculated by dividing the number of steps completed correctly during the session by the total number of steps to be completed and multiplying by 100. Mean treatment integrity was 97.22% (ranged from 88.88% to 100%).

Research Design

A single-subject, within-series A / B / C / C + D design was utilized in this study (Hayes et al., 1999). Single-subject designs involve the repeated measurement of target behaviours to assess the impact of the intervention across time (Hayes et al., 1999). As such, single-subject designs allow for analysis of change at the individual level. The design used in this study allowed for analysis to determine the effects of the training program, including examining specifically the impact of the three phases of the training program, with respect to Steven's development of flexible thinking and related social behaviours. The quantitative and qualitative measures administered pre-training and post-training were employed to aid in determining the effects of the training program. A diagram of the design can be reviewed in Figure 1.

Figure 1. Diagram of research design.



Although a research design with stronger experimental control was warranted, such as a multiple baseline design across participants, this study was explorative in nature and this chosen design was most useful for the development of an effective training protocol to be implemented with additional participants in future research studies

conducted by the thesis supervisor. Further, due to the nature of the target behaviours and the training program, a multiple baseline design across behaviours or contexts would not have been appropriate.

Procedure

Recruitment. A recruitment flyer was distributed to professionals from community agencies serving children with ASD located in the St. Catharines region (refer to Appendix F). The professionals were asked to give the flyer to the parents of clients that would be appropriate for this study based on age, diagnosis, and whether the individual had identifiable issues with flexibility. Interested parents were instructed to contact the thesis supervisor via phone or email, and upon contact they were given the letter of invitation for participation in this study (refer to Appendix G). Further, interested parents were given the letter of invitation for participation as a peer or sibling participant (refer to Appendix H). They were asked to give the letter to the parents of a potential peer participant, or to read the letter themselves as the parents of the sibling who may be involved in this study. A meeting was then scheduled to discuss this study with the interested parents and potential participants in greater depth, to answer any questions, and if appropriate, to proceed with the consent procedure.

Consent. Due to the age and diagnosis of the participant, the research team obtained verbal and written assent from Steven (refer to Appendix I), and alternative informed consent was obtained from his mother (refer to Appendix J). The informed consent form included a section in which Steven's mother gave permission for him to participate in this study, and a section in which she gave informed consent to participate in this study herself, as she was asked to complete a number of assessments, attend the

last 15 minutes of each training session, and support Steven in using the strategies acquired in training within natural contexts. Prior to obtaining assent and informed consent, the research team provided Steven and his mother with a full explanation of what participating in this study would entail, as well as what voluntary participation means. To ensure understanding, Steven was asked a number of questions about consent (refer to Appendix K). If Steven had trouble answering the questions, the information was to be explained again using simpler language, and the questions were to be asked until he demonstrated full understanding (i.e. all questions were answered appropriately). Following this explanation, Steven and his mother were given the opportunity to ask questions regarding this study and the consent process. They were then asked to sign the forms.

Finally, due to the involvement of Steven's sister in this study, consent to participate was also obtained from Sarah. Verbal and written assent was obtained from Sarah (refer to Appendix L), and alternative informed consent was obtained from her mother (refer to Appendix M). They received an explanation as to what participating in this study as a sibling would entail and what voluntary participation means. They were given a chance to ask questions, and then they were asked to sign the forms. Steven and Sarah's mother was provided with a copy of all assent and consent forms, which she was encouraged to keep in her records.

Intake assessments. Following the consent procedure the research team requested a copy of Steven's diagnostic report and administered the short form WISC-IV (Wechsler, 2003). These steps were taken to confirm that Steven met the inclusion criteria listed above.

Pre-training assessments. Steven and his mother took part in the pre-training interview, and Steven's mother completed the demographics questionnaire and the SRS (Constantino & Gruber, 2005). Upon completion of these assessments, Steven's mother began completing the weekly reports and Steven started in baseline. There were three baseline sessions, and each session was approximately 30 to 40 minutes in length. The sessions took place in Steven's home, and the investigator facilitated the first and second session, and both the investigator and the thesis supervisor facilitated the third session. Facilitation involved instructing Steven and Sarah to pick a game to play, and then attempting to be as unobtrusive as possible while they played the game. Steven and Sarah were not told who was to pick the game each time, or which games to pick, as the intention was to observe how they engaged in this interaction and made decisions. Steven and Sarah played one or two games within each baseline session, and the games included 3D Snakes and Ladders, Cadoo, Connect 4, Monopoly, Wii, and Robo Champ.

Training program. Steven completed a 10-week individual training program. There was one training session per week, which was 1.5 hours in length. The research team facilitated the training sessions: the investigator was present for nine of the sessions, and the thesis supervisor was present for seven of the sessions. To promote learning the sessions incorporated elements of discussion, fun activities, modeling, role-play, visual supports, verbal and video feedback, and verbal praise. Further, a token economy was added to the first seven training sessions (phase 1 and 2) to reinforce on-task and attentive behaviours. Tokens were given to Steven contingent on attentive behaviour, and if he received a predetermined number of tokens during the session (typically 8 to 10 tokens), then the tokens were exchanged for an item in a "grab bag". The grab bag included small

toys and candy, each of which was under $2 in value. Extreme discretion was taken to ensure that tokens were not used to reinforce the acquisition and generalization target behaviours, as the Social Thinking approach and the curricula under investigation does not include this type of reinforcement.

Steven's mother and/or father were included in the last 15 minutes of each session, and during this time the material covered in that session was reviewed. Steven's parents were continuously encouraged to make use of the material taught in the training sessions within the home, including applying the vocabulary terms and core concepts to naturally occurring social situations.

There were three phases of the training program, each of which involved lesson plans that were taken directly from the Social Thinking and Superflex curricula manuals. Refer to Appendix N for the schedule of the lesson plan(s) addressed in each session of the training program.

Phase 1: Social awareness training. The first phase of the training program included two sessions and focused on social awareness training. This phase was comprised of lesson plans from Winner's (2008b) *Think Social! A Social Thinking Curriculum*, with the supplementary children's book *You are a Social Detective* (Winner & Crooke, 2008) as the focal point. This phase was included in the training program based on the recommendations of Madrigal and Winner (2008), who have suggested that a foundational background in the Social Thinking concepts and vocabulary terms will lead to a greater understanding of the material addressed in the Superflex curriculum. As such, the purpose of this phase of the training program was to teach Steven knowledge that served as prerequisite information for the following phases of the training program.

At the beginning of this phase of the training program Steven's parents were given a handout with a list of the Social Thinking vocabulary terms taught in the sessions, and the definitions of these terms (refer to Appendix O). The research team reviewed this handout with Steven's mother, encouraging her to become familiar with the information. This was done so that Steven's parents were able to talk to him about social situations using the vocabulary terms, thus continuing learning throughout his daily interactions. Further, at the end of both sessions in this phase Steven was given the Social Detective homework report to complete for the following session (refer to Appendix P). Steven was required to list three examples of expected behaviours and three examples of unexpected behaviours that he did that week, pick one example from each type of behaviours and draw a picture, and describe how the behaviours made other people think about him.

Phase 2: Flexible thinking training. The second phase of the training program included five sessions and focused on teaching flexible thinking. This phase was comprised of lesson plans and supplementary resources from Madrigal and Winner's (2008) *Superflex, A Superhero Social Thinking Curriculum.* The purpose of this phase of the training program was to introduce Superflex and the Team of Unthinkables as an instructional tool to teach Steven how to be a more flexible thinker. Following the recommendation in the curriculum manual, Steven was given a "Superflex Award" at the end of each session, which was used to reinforce something good that he did within the session.

Similar to the first phase of the training program, at the beginning of this phase Steven's parents were given handouts to aid in them becoming more familiar with the Superflex material (refer to Appendix Q). The first handout was an introduction letter

describing the Superflex curriculum and how to use the material at home. The second handout was a chart describing Superflex and his strengths, as well as a list of all of the Unthinkables, their "powers" and Superflex Strategies to defeat each character. Additionally, at the end of each session in this phase Steven was given the Superflex homework report sheet to complete for the following session (refer to Appendix R). Steven was required to draw a picture or write about a time that week where he called on Superflex to defeat an Unthinkable, and to draw a picture of what the Unthinkable was thinking at that time.

Phase 3: Flexible thinking training + behavioural contingency plan. The third phase of the training program included three sessions. This phase continued using lesson plans and supplementary resources from Madrigal and Winner's (2008) *Superflex, A Superhero Social Thinking Curriculum*, as in the second phase of the training program, however a behavioural contingency plan was added. In this phase the token economy for attentive behaviours was discontinued, and a token economy was implemented to reinforce Steven when engaging in flexible thinking and flexible social behaviour. Tokens were given to Steven during the training session while engaging in the lesson plan activities and through delayed video feedback: in each session Steven viewed video clips from the previous probe session and discussed the clips with the research team. More specifically, Steven could earn tokens three ways:

1. When he used the vocabulary terms and Superflex Strategies in conversation with the research team related to the lesson materials or specific examples of his behaviour during the week where he had Superflex moments.

2. When he was being Superflex, using a Superflex Strategy to defeat an Unthinkable, or using expected behaviour within the video clip of the probe session.
3. When he was being an Unthinkable within the video clip of the probe session but in the training session he could identify and discuss how he could have used a Superflex Strategy to defeat the Unthinkable.

The token economy was clearly explained to Steven, and a visual was put in place to remind him of the ways he could earn tokens. If Steven received 10 tokens during the session, then the tokens were exchanged for Pokémon cards. Earlier in the training program Steven and his mother reported that Pokémon cards were highly reinforcing to Steven. The purpose of this phase of the training program was to examine whether adding a behavioural strategy results in greater changes in Steven's behaviour in the training and probe sessions. Finally, as with the second phase of the training program, at the end of each session Steven received a "Superflex Award" and was given the Superflex homework report sheet to complete for the following session.

Probe sessions. In addition to the training session, every week of the training program Steven and Sarah participated in a probe session. As such, there were 10 probe sessions and the sessions aligned with each of the three phases of the training program. The probe session occurred one day following the training session, with the exception of week six, in which the probe session was two days following the training session. This delay was due to issues with availability. The investigator facilitated eight of the sessions, and the thesis supervisor facilitated two of the sessions. Each probe session was approximately 30 to 40 minutes in length, and was conducted in the same manner as the baseline sessions. Steven and Sarah played one or two games within each probe session,

and the games included Monopoly, Pictionary Jr., Hedbanz, Trouble, Disney Bingo, Operation, Guess Who, Guess Who Mix and Match, Divin' Dolphins, Disney Yatzee, Connect 4, and 3D Snakes and Ladders. Three of the games were played both in a baseline session and a probe session (Monopoly, Connect 4, and 3D Snakes and Ladder), and two of the games were played in more than one probe session (Pictionary Jr. and Guess Who Mix and Match).

Post-training assessments. Following completion of the training program Steven, Sarah, and their mother took part in the post-training assessments. The – investigator administered the assessments, which occurred two and a half weeks after the last training session. Although it would have been preferable to administer the assessments within a week of the last training session, this was not possible due to the family being away on vacation. At this time Steven, Sarah and their mother each completed the post-training interview, and for the second time Steven's mother completed the SRS (Constantino & Gruber, 2005). Steven's mother was also asked to review the demographics questionnaire completed during the pre-training assessment and to indicate whether there were any changes. Further, Steven and Sarah participated in a post-training probe session. This session was conducted in the same manner as the baseline and probe sessions.

Follow-up probe session. Approximately one month after the post-training assessments Steven and Sarah participated in a follow-up probe session. This session was conducted in the same manner as the baseline, probe and post-training probe sessions. At this time the interviews and the SRS were not re-administered.

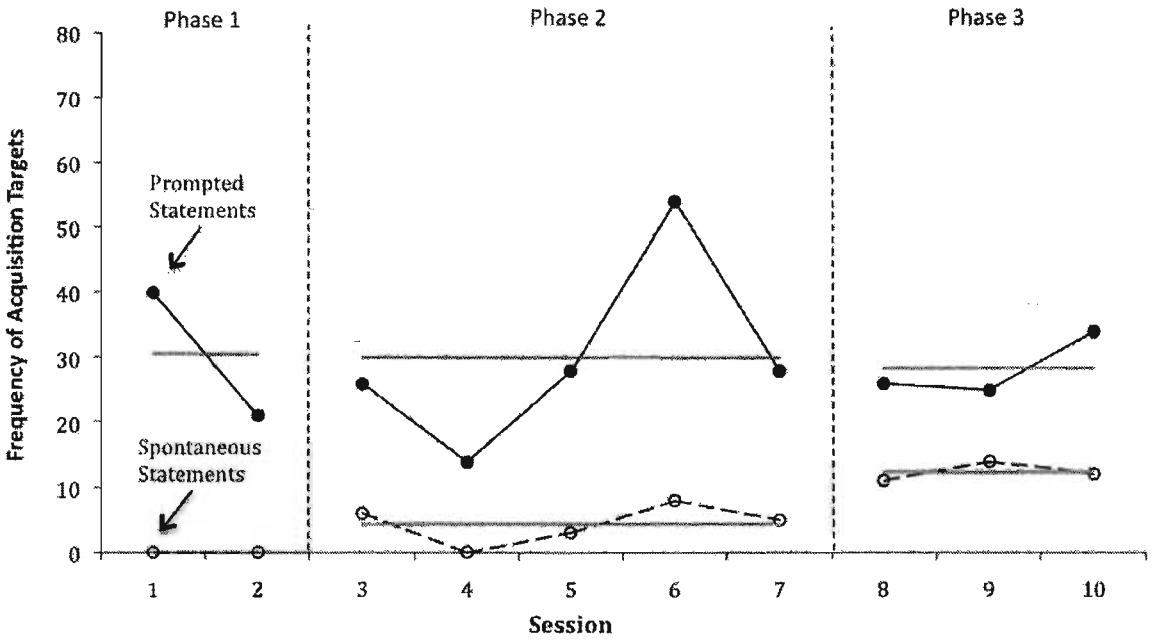
Chapter 5: Results

Direct Observation

Direct observation data were primarily analyzed through visual inspection of graphs. Visual inspection involves interpreting the trend, variability and level of the data within and across the condition phases, as well as identifying any patterns of change in the data (Cooper et al., 2007; Hayes et al., 1999). This allows for conclusions to be drawn on whether correlations exist between the training program and the target behaviours.

Acquisition target behaviours. The frequency of acquisition targets within the training sessions was graphed, broken down into prompted and spontaneous statements (refer to Figure 2).

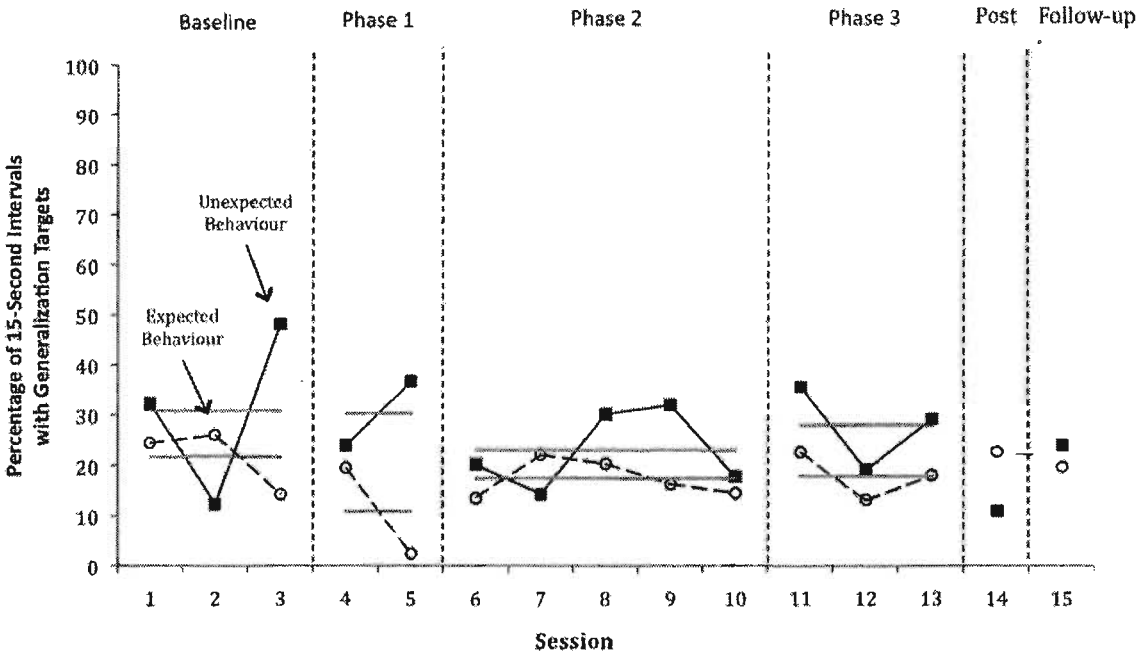
Figure 2. Frequency of acquisition target behaviours.



Across all 10 training sessions, the frequency of prompted statements was considerably higher than the frequency of spontaneous statements, however this discrepancy appeared to reduce in size within the third phase of the training program. Initial inspection of the graph revealed no obvious trend in the data for prompted statements across the three training phases, and a delayed and gradually increasing trend in the data for spontaneous statements. Further, the data for the prompted statements had a high degree of variability within phase one and phase two of the training program (data ranging from 21 to 40, and 14 to 54, respectively), and a smaller degree of variability within phase three (data ranging from 25 to 34). In contrast, the data for the spontaneous statements had relatively little variability within all three phases of the training program (0 variability in phase one, data ranging from 0 to 8 in phase two, and from 11 to 14 in phase three). Inspection of the mean level lines for each phase of the training program revealed that despite variability within each phase, the mean level of prompted statements remained consistently high across all three phases (mean of 30.50, 30, and 28.33, respectively). Further, the mean level lines revealed that the mean level of spontaneous statements increased across the three phases of the training program (mean of 0, 4.40, and 12.33, respectively). Refer to Appendix S for tables containing the data for the prompted and spontaneous statements, broken down into the target codes.

Generalization target behaviours. The percentage of 15-second intervals with generalization target behaviours within the probe sessions was graphed, broken down into the categories of expected behaviours and unexpected behaviours (refer to Figure 3).

Figure 3. Percentage of 15-second intervals with generalization target behaviours.

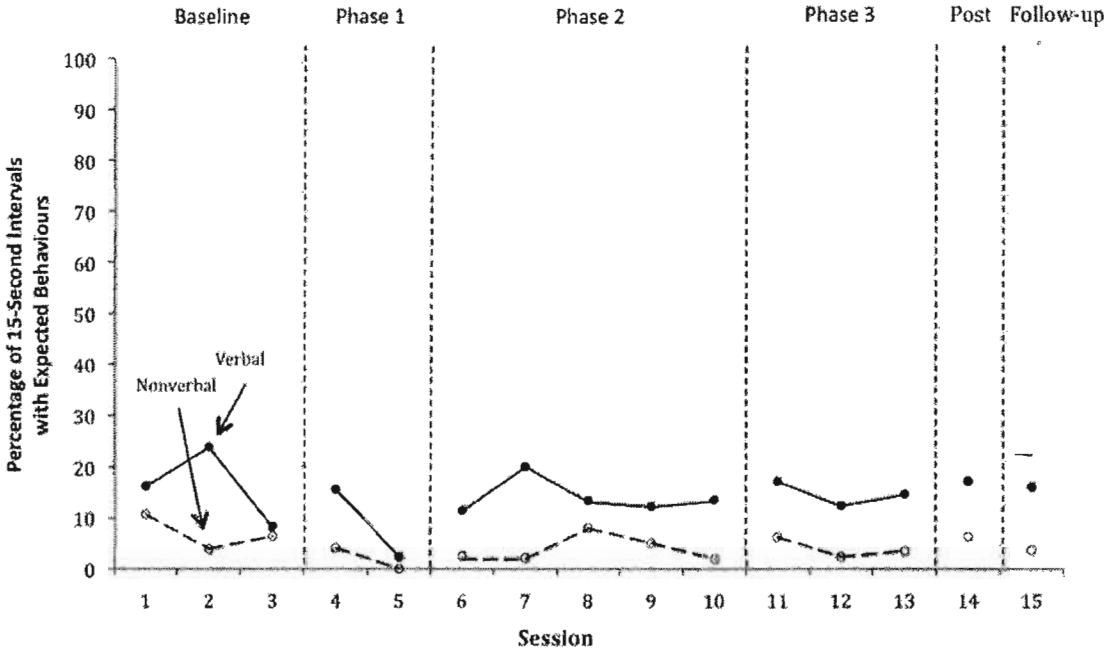


With the exception of three sessions across the condition phases, in each session the data point for the unexpected behaviours was higher than the data point for the expected behaviours, which indicated that Steven engaged in more unexpected behaviours than expected behaviours throughout the duration of this study. Initial inspection of the graph revealed that across the condition phases there were no obvious trends in the data. Further, it was revealed that the data were highly variable within and across all condition phases for both expected and unexpected behaviours. Within baseline Steven's expected behaviours ranged from 14.28% to 26.15% over three sessions, and following the start of the training phases his behaviour remained variable, ranging from 2.29% to 22.65% over 12 sessions. Within baseline Steven's unexpected behaviours ranged from 12.30% to 48.21%, and following the start of the training phases his behaviour remained variable, ranging from 10.93% to 36.78% over the 12 sessions.

Inspection of the mean level lines confirmed the high degree of variability in the data, as few of the data points fell close to each of the lines. Although the mean level lines were interpreted with caution due to the variability of the data (Cooper et al., 2007), the mean lines illustrated that the mean level of expected and unexpected behaviours remained somewhat stable across the condition phases. With respect to the expected behaviours, the mean level declined slightly in the first phase of the training program, which was followed by a return to near baseline levels in the second and third phases. With respect to the unexpected behaviours, the mean level was consistent in baseline and the first phase of the training program, and there was slight variability in mean level across phase two of training, phase three of training, the post-training data point and the follow-up data point.

The percentage of 15-second intervals with the expected generalization target behaviours was graphed, with the data broken down into verbal and nonverbal (refer to Figure 4).

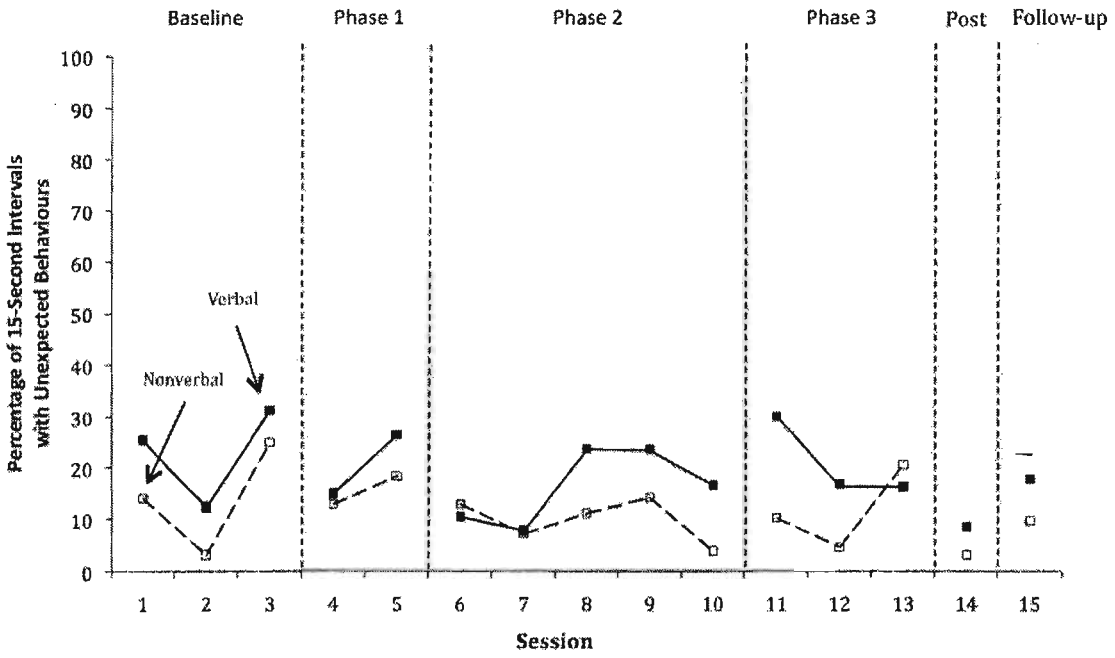
Figure 4. Percentage of 15-second intervals with expected generalization targets.



Within each session the data for the verbal expected behaviours were higher than the data for the nonverbal expected behaviours, which remained consistent across the condition phases. This indicated that Steven engaged in more verbal expected behaviours than nonverbal expected behaviours throughout the duration of this study.

The percentage of 15-second intervals with the unexpected generalization target behaviours was also graphed, again with the data broken down into verbal and nonverbal (refer to Figure 5).

Figure 5. Percentage of 15-second intervals with unexpected generalization targets.



There was slightly more variability in this graph compared to that of the expected behaviours. The data for the verbal unexpected behaviours were higher than the data for the nonverbal unexpected behaviours, however there was overlap in the data for three of the sessions. This indicated that for the majority of this study Steven engaged in more verbal unexpected behaviours than nonverbal unexpected behaviours.

Additionally, the data were analyzed to determine whether there were any specific improvements in the generalization target behaviours following the implementation of the training program compared to baseline. With respect to the expected behaviours (verbal and nonverbal data combined), none of the data points were higher than the highest baseline data point (26.15%). This was also the case when the data were broken down into verbal and nonverbal (highest baseline data point was 23.84% and 10.56%,

respectively). This indicated that Steven did not demonstrate an increase in expected behaviours following the implementation of the training program.

With respect to the unexpected behaviours (verbal and nonverbal data combined), only the post-training data point was lower than the lowest baseline data point (10.93% and 12.30%, respectively), and the magnitude of this improvement was very small (a decline of only 1.37%). However, differences were found when the unexpected behaviours were broken down into verbal and nonverbal. In examining the verbal unexpected behaviours, two of the data points from the second phase of the training program and the post-training data point were lower than the lowest baseline data point (10.48%, 7.85%, 8.59%, and 12.30%, respectively), with a decline ranging from 1.82% to 4.45%. In examining the nonverbal unexpected behaviours, none of the data points were lower than the lowest baseline data point (3.07%). Despite modest changes, the data indicated that Steven did not demonstrate a decrease in unexpected behaviours following the implementation of the training program. Refer to Appendix T for a table containing the data for the generalization target behaviours, broken down into the categories of expected behaviours and unexpected behaviours, including verbal, nonverbal and combined data.

Antecedent-behaviour-consequence (ABC) assessment. Following the initial analysis of the data on the generalization target behaviours via visual inspection, an antecedent-behaviour-consequence (ABC) assessment was conducted to analyze whether there were clear and consistent triggers for Steven's unexpected behaviours. An ABC assessment is a descriptive functional behaviour assessment that is often conducted in applied behaviour analysis (ABA) to identify events that may be correlated with a target

behaviour, thereby suggesting the function of the behaviour (Cooper et al., 2007). This type of assessment involves recording a temporally sequenced account of the behaviour of interest, as well as the events that occur immediately prior to and following the behaviour (Cooper et al., 2007).

The ABC assessment was conducted on the third baseline session and on the second probe session, as these were the two sessions with the highest percentage of 15-second intervals with unexpected behaviours (refer to Appendix U for the data obtained in the ABC assessment). In total, 69 incidents of unexpected behaviours were included in the assessment. Analysis of the ABC data revealed that unexpected behaviours occurred during both preferred games (for example, Wii) and less preferred games (for example, Robo Champ), and that the unexpected behaviours were directed towards both Sarah (for example, yelling at her or pushing her) and the game itself (for example, throwing game pieces). Overall, it appeared that the majority of Steven's unexpected behaviours occurred in an attempt to control the situation or Sarah's behaviour, or as an expression of frustration when he was unsuccessful in achieving or maintaining such control.

Parent Reports

The data obtained from the parent report forms completed weekly by Steven's mother were reviewed and analyzed for evidence of generalization of the training material to changes in his flexibility in naturally occurring social situations. The first two questions asked Steven's mother to provide examples of situations in which he was inflexible (question one) and flexible (question two). As well, she was to indicate whether he used Superflex Strategies when dealing with the situation, what he said about his thoughts and feelings about the situation, and to rate how well he handled the situation on

a 5-point Likert scale. Steven's mother's responses to questions one and two were recorded into tables to aid with organization and data analysis (refer to Table V1 and Table V2 in Appendix V).

With respect to question one, each week Steven's mother was able to identify a situation in which Steven was inflexible. Further, across all 12 weeks she reported that he did not make use of the Superflex Strategies taught in the training program when dealing with the situation. For four out of the 12 weeks she reported that he said nothing about his thoughts and feelings about the situation, and in regards to the eight weeks that he did say something, there was no apparent improvement as the study progressed in the quality of his comments or his level of understanding related to the situation or his behaviour. Her ratings on how well he handled the situation ranged from 1 ("very ineffectively") to 2.5 (between a score of "satisfactorily" and "ineffectively").

With respect to question two, each week Steven's mother was able to identify a situation in which Steven was flexible. For only one of the weeks across the duration of the study she reported that he used Superflex Strategies when dealing with the situation. This occurred in the eighth week of completing the form, however she only indicated, "he chose to defeat Glassman" (Appendix V, p. 183), and not the actual strategy he used to be flexible in that situation. For six of the 12 weeks she reported that he said nothing about his thoughts and feelings about the situation, and for the six weeks that she reported that he did say something, his comments were mostly related to being proud of himself for not getting upset in the situation and a general sense of happiness. Her ratings on how well he handled the situation ranged from 3 ("satisfactorily") to 5 ("very effectively").

Questions three to eight on the parent report form were related to Steven's level of flexibility in different contexts, and Steven's mother was required to rate her response to each question on a 5-point Likert scale (refer to Table V3 in Appendix V for the data for Steven's mother's responses to questions three to eight). Question seven (which asked whether Steven was rigid and stuck in his way of thinking) was reverse scored to match the rank scoring of the other five questions. For each week the total score was calculated by obtaining the sum of responses for the six questions. The highest possible score was 30, which represented always flexible, and the lowest possible score was 6, which represented never flexible. Further, the percentage was calculated for each total, to aid in making comparisons of the data over the duration of this study.

Overall, Steven's mother's total score rating of his flexibility increased from 40% in the first week she completed the report form to 73.33% in the last week, which is an increase of 33.33% over 12 weeks. Further, Steven's mother's total score rating increased progressively over the duration of the study, with the exception of a slight decline during weeks five through seven, and in week ten. The data for each question demonstrated a similar pattern, in that Steven's mother's ratings increased progressively for each question. More specifically, for four of the questions (questions three, four, seven and eight), her ratings increased with slight variability across the duration of the study, and for two of the questions (questions five and six), her ratings increased progressively without any decreases. Despite the reported improvement in his flexibility across different contexts, at no point over the duration of this study did Steven's mother rate any of the questions as a 5. This indicated that she perceived there were still improvements that could have been made in his ability to be flexible.

The report form also included a section where Steven's mother could provide additional comments regarding the training program or Steven's flexibility in thinking and behaving. On two occasions Steven's mother made comments in this section, both of which suggested that Steven had demonstrated improvements in his behaviour in the natural environment. In the eighth week of completing the form Steven's mother reported, "Definite improvements in [his] thinking and behaving!" and in the eleventh week she reported, "Definite improvement in behaviour in social situations, even his babysitter has found a huge improvement with [his] and [his sister's] interactions."

Finally, the data obtained from the Significant Upsets and Inflexibility Recording Form were summarized in a table (refer to Table V4 in Appendix V). On the form there were four types of behaviour that Steven's mother could report occurring within the week, and upon review of the data, one of the types was further divided into two, thereby making five types of behaviour for analysis. This was done to better represent the types of behaviour reported: initially rude comments, intruding in other's personal space, and aggression towards others were categorized together as "inappropriate actions;" however based on Steven's mother's comments on the form each week, the data on aggression was pulled out and included as a separate type of behaviour. The data gathered from this form did not serve as a frequency count of all of the behaviours Steven engaged in each week, as Steven's mother indicated that she was not able to report all behaviours due to time constraints, and because each week Steven spent varying amounts of time with his mother, due to her working full-time during weekdays. Rather, this data provided an account of the types of behaviours Steven engaged in, and was useful in illustrating whether any changes had occurred in his behaviour over the duration of this study.

Overall, Steven's mother reported varying levels of each type of behaviour across the 11 weeks she completed this form. Despite variability in the behaviours reported over the duration of this study, the data revealed consistencies between the unexpected behaviours the investigator frequently observed in the direct observation probe sessions and the behaviours that Steven's mother observed in naturally occurring daily social situations.

Interviews

Following transcription of the interviews, the transcripts were reviewed and pertinent questions and comments were highlighted. For each individual (participant, parent, sibling), the data were organized into two categories. The first category was interpretations of Steven's inflexibility and flexibility, and this category included data from questions asked in both the pre-training and post-training interviews. The second category was reflections on the training program, and this category included data from questions asked in both interviews for Steven's mother, and questions asked in only the post-training interview for Steven and Sarah. The data were organized into tables based on these categories (refer to Appendix W).

Once the interview data were organized, a content analysis was carried out for each of the two categories for the purpose of identifying response patterns. Four levels of analysis were undertaken. First, general findings were highlighted. Second, the data were examined to describe patterns in how each individual responded to the questions. Third, key words, qualifiers and revelatory phrases were pulled out to explore patterns in expression. Fourth, specific people, places, things / objects and happenings discussed in the interviews were pinpointed to examine important areas for each individual. A within

case analysis was conducted to provide a descriptive account of each individual's data (refer to Appendix X). A cross case analysis was then conducted to provide a comparison of the data across the three individuals.

Interpretations of inflexibility and flexibility. The objective of this study was to examine Steven's ability to be flexible in social situations, and to determine whether the training program resulted in meaningful changes in his inflexible and flexible behaviours in the natural environment. Therefore, a number of questions were asked which required Steven, Steven's mother, and Sarah to provide examples of situations in which Steven was inflexible and flexible (in both the pre-training and post-training interview), and to provide insight as to whether his ability to handle such situations had improved (in the post-training interview).

Participant. With respect to the general findings from Steven's pre-training interview, he was able to identify a situation in which he was inflexible, and he was able to answer prompting questions regarding the situation. However, Steven had difficulty identifying a situation in which he was flexible, and it appeared as though he did not fully understand the concepts of inflexible and flexible. Steven indicated that on a scale from 0 to 10, his level of flexibility was a 5, which may have been a "safe" choice given uncertainty about the concepts or the rating scale.

When Steven's responses in the pre-training interview were further examined to investigate how he answered each question, a pattern of responding emerged, in that the investigator had to frequently repeat the question asked, and his words were often mumbled. Further, he responded to the questions appropriately and used examples when asked, but his responses were short in length. The only key word identified was "fight,"

which he used twice, and he did not use qualifiers in his responses. His responses centered on things having to be done his way, and he focused on his interactions with his family, both within their house and on a family outing. For example, he fought with Sarah because she was in his seat and he had to sit there, and when he wanted to go to Center Island with his family, "they did what I wanted to do" (Appendix W, p. 187).

With respect to the general findings from Steven's post-training interview, Steven had greater difficulty answering the questions asked compared to the pre-training interview. Initially he was unable to identify a situation in which he was inflexible, and when he finally thought of an example his responses to prompted questions about the situation were limited. Moreover, Steven was unable to identify a situation in which he was flexible. As in the pre-training interview, Steven indicated that on a scale from 0 to 10, his level of flexibility was a 5, which could suggest that he did not see a change in his level of flexibility from the beginning to end of the training program.

When Steven's responses in the post-training interview were further examined, the pattern of responding that emerged was similar to that of the pre-training interview. For the majority of the questions he required repeated questioning and probing, his words were often mumbled, and his responses were short. Further, in the post-training program he paused after the questions were asked before responding, presumably to process the question and to give thought to his answer, or to avoid answering challenging questions. A few of Steven's responses were characteristic of echolalia, as he repeated key words the investigator used in the question, for example "inflexible", and key words he used when responding, for example "tough." As in the pre-training interview, Steven used the

key word "fight". Although his responses and his level of detail were limited, the focus was on fighting with Sarah.

Parent. With respect to the general findings from Steven's mother's pre-training interview, she was able to identify a situation in which Steven was inflexible, as well as a situation in which he was inflexible and then became flexible. Further, she discussed the difficulties Steven had within the contexts of understanding her perspective, changing his behaviour to meet the expectations of others, being flexible in conversations, and being flexible in peer interactions. Steven's mother indicated that on a scale from 0 to 10, Steven's level of flexibility was a 3.

When Steven's mother's responses in the pre-training interview were examined a pattern of responding emerged, in that the responses and examples she provided did not answer the specific question asked, and rather many were generalized proclamations. A few of her responses were long and detailed, however for the most part her responses were short and prompting questions were posed by the investigator to gather more detail. Key words identified in the interview were "rigidity," "inflexible," "flexible" and "fight" / "fighting." Further, she frequently used qualifiers in her responses, including "really" and "very." Her responses to the questions included a number of revelatory phrases, many of which were used when she discussed Steven's inflexibility / flexibility, and situations in which Steven and Sarah were fighting. Most notably, Steven's mother reported, "... I just, sometimes I wonder do I interfere or do I just stay out of it and let them figure it out? But then I think well he has autism, can he figure it out?" (Appendix W, p. 195). Further, she stated, "He's much more pleasant to be around when he is able to be more flexible" (Appendix W, p. 195). When areas of importance were examined, it

was revealed that her responses centered on Steven, Sarah, herself, the family as a whole, and Steven's peers, and she focused on situations that occurred in their house and while on a family outing. Further, she discussed Steven's inflexibility related to having conversations with peers and with going on a family outing, and with Steven and Sarah fighting.

With respect to the general findings from Steven's mother's post-training interview, she was able to identify a situation in which Steven was inflexible, as well as one where he was flexible. Further, she expressed that she had noticed a differenee in Steven's behaviour within the context of being flexible in peer interactions, but that Steven still had difficulty within the context of being flexible in conversations with others. She stated more than once that she thought Steven had become more mature in handling situations. Steven's mother indicated that on a scale from 0 to 10, Steven's level of flexibility was between 7 and 8, which suggested that her perception was that Steven's level of flexibility changed considerably between the beginning and end of the training program.

When Steven's mother's responses in the post-training interview were further examined, the pattern of responding that emerged was similar to that of the pre-training interview. Her responses to many of the questions and many of the examples she provided did not answer the question asked by the investigator. Further, her responses were more specific to actual situations, however she continued to make proclamations regarding Steven's behaviour. Unlike in the pre-training interview, the majority of her responses to the questions were long and detailed, and therefore the investigator asked fewer prompting questions. A number of key words were identified, two of which she

also used in the pre-training interview ("inflexible" and "fight"). She used qualifiers more frequently in the post-training interview compared to the pre-training interview, including "really," "very," "exactly" and "absolutely." Similar to the pre-training interview, several of her responses were revelatory phrases, which she used to describe Steven's increasing maturity and flexibility. Most notably, Steven's mother expressed:

> I just find him to be a little bit more mature in the last couple of months, and I don't know if that's just something that's coming with age, or if it is, it's probably a contributing factor everything that he's learned with this as well as um, I don't know, I'm not exactly sure, you know, it's hard to judge exactly if this was the reason for it, but I'm sure that it has something to do with it (Appendix W, p. 193)

When areas of importance were examined, her responses were centered on Steven, Sarah, herself, the family as a whole, and Steven's uncle, and again she focused on situations that occurred in their house and while on family outings, including a family trip. The majority of the situations involved Steven being inflexible and/or flexible with respect to taking part in the event.

Sibling. Only a post-training interview was conducted with Sarah, and the general findings were that she was able to identify a situation in which Steven was inflexible, however when prompting questions were asked, Sarah's responses reflected Steven being aggressive more so than inflexible. Sarah had difficulty identifying a situation in which Steven was flexible; in fact, her responses were more reflective of her being flexible to accommodate his inflexibility. As with Steven's interview responses, it was speculated that Sarah lacked understanding of the concepts, or simply that Steven had not been

flexible and therefore she did not have a more appropriate situation to identify and discuss.

When Sarah's responses were further examined to investigate how she answered the questions, a pattern of responding emerged, in that her responses to the questions were long and detailed, however at times they did not answer the actual question asked by the investigator. Numerous key words were identified in the interview, which included "angry," "upset," "hurt" / "hurted" / "hurting," "fight," and "battled." Further, she used the qualifier "really" twice. Her responses included a number of revelatory phrases, which she used to describe Steven's inflexibility and situations when Steven and her were fighting. Most notably, Sarah stated, "… I think he improved, I think the only time we battled was yesterday" (Appendix W, p. 200). Additionally, Sarah reported "I made him feel happy, when he's happy, it makes him flexible, it makes him play fair and stuff" (Appendix W, p. 200-201). When areas of importance were examined, it was revealed that her responses centered on Steven and herself, more specifically, on them playing games, fighting, and Steven hurting her.

Comparisons across individuals. When comparing all three individual's interpretations of Steven's inflexibility and flexibility, both similarities and differences were evident. Steven, Steven's mother and Sarah were each able to indentify situations in which Steven was inflexible, however the amount of detail provided differed. Further, both Steven and Sarah had difficulty with providing a clear example of a situation in which Steven was flexible.

Steven's mother and Sarah had similar patterns of responding, in that they both often provided responses that did not directly answer the questions that were asked by the

investigator. Further, both Steven's mother and Sarah provided lengthier answers than the responses given by Steven, and both frequently used qualifiers in their responses, whereas Steven used very few. The only key word used consistently across all three individuals was "fight." A common focus of discussion across all three individuals was Steven's interactions with his family, particularly Sarah, and situations that involved fighting. Steven and Sarah's responses centered around situations where fights occurred while they were playing games together, whereas Steven's mother's responses were more broad, as she discussed Steven's behaviour during family outings and while he interacted with peers, in addition to Steven and Sarah fighting. Although all three individuals stated that Steven and Sarah fought, only Sarah expressed the extent to which Steven hurt her and her accommodating him in order to avoid conflict.

Overall, Steven's mother and Sarah both indicated at least once that they felt that Steven had demonstrated improvements in his ability to be flexible, however at times their discussions provided evidence of specific situations that contradicted this broad interpretation. In comparing the content of the interviews more abstractly, it appeared as though both Steven and Sarah may have lacked full understanding of the concepts inflexible and flexible, thereby impacting their ability to answer the questions appropriately and accurately. In contrast, Steven's mother appeared to take on a more broad definition of these concepts, which encompassed a greater range of contexts in which Steven could be inflexible or flexible.

Reflections on the training program. In addition to questions regarding Steven's inflexibility and flexibility in naturally occurring social situations, the interviews also focused on the training program, and whether each individual perceived it

to be effective in changing Steven's behaviour. The questions under this category were slightly different for each individual, reflecting each individual's level of participation in the training program.

Participant. With respect to the general findings from the questions in Steven's post-training interview related to the training program, he was able to talk about Superflex and the Team of Unthinkables, including the primary concepts taught within training, however some of his responses suggested uncertainty. Steven reported that he defeated the Destroyer of Fun, and that he did this "by doing nice things and doing what other people different want to do" (Appendix W, p. 190). Steven indicated that on a scale from 0 to 10, the effectiveness of the training program in helping him be more flexible was a 5.

Steven's responses were further examined to investigate how he answered each question. A pattern of responding emerged, in that he frequently paused between some of the questions and his response, and he often required repeated questioning and probing from the investigator. His responses were short in length, but despite the pausing and probing, he responded to the questions appropriately. The key words he used related directly to the training program material, including "Superflex" and "defeating" the "Unthinkables." Steven used few qualifiers in his responses, however a number of his responses included revelatory phrases. Most notably, when asked what he learned in the training program, he stated, "That there's Unthinkables everywhere, not much people know about the Unthinkables" (Appendix W, p. 191), and when asked why that was important to learn, he responded, "Because that way the earth could be a lot nicer" (Appendix W, p. 191). When areas of importance were examined, his responses centered

on himself, the characters from the training program, and generalizations, such as references to "everybody" and "other people." With respect to things/objects, his responses included the brain sensor and the thermometer used to identify the size of a problem, both of which were used in the training program, and prizes, which he stated he enjoyed receiving while attending the training sessions. Further, his discussions focused on doing things that are nice, like Superflex, versus doing things that are bad, like the Unthinkables, as well as learning about the characters in the training program.

Parent. In addition to the questions asked in the post-training interview, which were similar to those asked of Steven and Sara, Steven's mother was also asked one question in the pre-training interview about the training program. As such, both interviews were compared in this analysis. With respect to the general findings, in the pre-training interview Steven's mother indicated that as a result of Steven participating in the training program, she wanted him to become better with social interactions, specifically in the areas of doing what other people want to do and having back-and-forth conversations. In the post-training interview, Steven's mother stated that she had used the vocabulary terms and strategies taught in the training program to trigger Steven to change his behaviour. Overall, she emphasized the importance of using the terminology, and she indicated that on a scale from 0 to 10, the effectiveness of the training program in helping Steven be more flexible was an 8. In the post-training interview Steven's mother made reference to her goals for the training program stated in the pre-training interview, in that Steven's social interaction and cooperation improved, and that his social conversation skills did not improve.

When Steven's mother's responses were further examined, a pattern of responding emerged that was similar in both her pre-training interview and her post-training interview. For all of the questions her responses answered what was asked, and her responses were general statements. Her responses were short in length but clear and to-the-point. Key words in the pre-training interview were related to behaviour ("social interactions" and "conversations"), and the key words in the post-training interview were directly related to the training program material, including "Superflex" and several of the Unthinkable characters, as well as the word "trigger" / "triggers." She used qualifiers more often in the post-training interview, including "really," "very" and "absolutely." Her responses to the questions included revelatory phrases, which she used to describe her perceptions of the training program. Most notably, she stated, "... I thought it was great, it was a really good program..." (Appendix W, p. 198). When areas of importance were examined, her responses centered on Steven, Sarah and herself, as well as contexts that were addressed within the questions, including working on the homework tasks, using the vocabulary terms in conversations with Steven, and the training program itself.

Sibling. With respect to the general findings of Sarah's post-training interview related to the training program, she reported that Steven had taught her a little bit about Superflex and the Team of Unthinkables, but when asked to elaborate, she had difficulty expressing what she knew about the characters and the primary concepts of the training material. Sarah also indicated that she found that participating in the probe sessions was fun. However her responses made it clear that Steven often hurt her in situations where he was inflexible, and that as a result of a past situation where he hurt her more severely, she

continuously calmed him down and was more flexible herself in order to avoid getting hurt.

When Sarah's responses were further examined to investigate how she answered the questions, a pattern of responding emerged, in that her responses to the questions were long and detailed, however at times they did not answer the actual question asked by the investigator, and often parts of her examples were off-topic. The key words identified related to the training material (which included "Superflex," "Unthinkables" and several of the Unthinkable characters) and to conflict (which included "angry," "upset," "hurt" / "hurts" / "hurted" / "hurting," "argue," "fight," and "calm" / "calmed"). Further, she frequently used qualifiers in her responses, including "really" and "actually." Her responses to the questions included several revelatory phrases, all of which were used when she was discussing Steven hurting her, or her doing things to avoid getting hurt by Steven. Most notably, Sarah reported, "… he's angry at me, and I calmed down really quick, and didn't get hurt, but sometimes he hurts me" (Appendix W, p. 202). Additionally, she expressed "It makes me feel really, really upset because it keeps reminding me of the time that he made me not breathe. He was on a chair and jumped and tucked himself, you know cannonballs? He cannonnballed on me" (Appendix W, p. 202). When areas of importance were examined, her responses were centered on Steven, her Nana, herself, and the characters from the training program. She focused on situations that occurred in their house, while on a family trip and at Brock University, and more specifically she talked about Pokémon cards, fighting with Steven and getting hurt, playing tag with Steven, and Steven teaching her about the Unthinkables.

Comparisons across individuals. As with the analysis of the first category, both similarities and differences were evident when all three individual's reflections on the training program were compared. However, because the same questions were not asked across all three individuals, as they were in the first category, the comparisons made in this category were less direct. Steven and Steven's mother both discussed the training material, as well as what they each thought was important, and their responses were reflective of the training program being a positive experience. Steven's mother's responses focused more on the vocabulary terms, and the importance of her using the terminology to trigger Steven to be more flexible in social situations. Further, she indicated that the program was effective in helping Steven become more flexible, and expressed that the training program was "great." Steven stated that it was important to be aware of the Unthinkables and how to defeat them, and he reported that he was successful in defeating the Destroyer of Fun. However, Sarah's responses to her questions provided contradictory evidence on the effectiveness of the training program. She described recent situations in which Steven was still very inflexible in his interactions with her, and these situations often led to conflict and aggression.

Steven and Steven's mother had similar patterns of responding, in that they both provided responses that answered the questions asked, and they provided responses that were short in length. In contrast, Sarah's responses often did not answer the questions asked, and she provided responses that were long, detailed, and off-topic. Steven used very few qualifiers in his responses, whereas Steven's mother and Sarah frequently used qualifiers when expressing their responses. All three individuals made use of key words related to the training material and the discussion centered on the training program.

However additional key words were identified in Sarah's interview, all of which related to fighting with Steven, and her responses were broader, in that she discussed the training program as well as situations where she interacted with Steven.

Social Responsiveness Scale (SRS)

The pre-training and post-training SRS scores obtained from Steven's mother were analyzed to evaluate Steven's social competence. As stated above, higher scores reported on the SRS indicate a greater severity of impairment in social competence (Constantino & Gruber, 2005).

Total scores. Based on examination of the raw scores reported by Steven's mother, there was a considerable decrease in the total score from the pre-training assessment to the post-training assessment (97 and 62, respectively).

The total *T*-score reported by Steven's mother in the pre-training assessment was 80, which was within the severe range. In examining the scores using two *SEMs*, a total *T*-score of 80 indicated that the true score fell between 75.8 and 84.2 (80 minus and plus 4.2). This interval was also within the severe range; thereby it provided confidence in the interpretation that Steven had a severe degree of impairment in social competence at the time of the pre-training assessment. The total *T*-score reported by Steven's mother in the post-training assessment was 64, which was within the mild to moderate range. In examining the scores using two *SEMs*, a total *T*-score of 64 indicated that the true score fell between 59.8 and 68.2 (64 minus and plus 4.2). This interval was also within the mild to moderate range; thereby it provided confidence in the interpretation that Steven had a mild to moderate degree of impairment in social competence at the time of the post-training assessment. In comparing the pre-training and post-training total scores, it

appeared that Steven's level of impairment changed, which suggested that his overall social competence improved.

Treatment subscale scores. The pre-training and post-training *T*-scores and two *SEM*s for each of the treatment subscales, as well as the variance between the pre-training and post-training scores were summarized in a table and analyzed to determine the effects of the training program (refer to Table 4). *T*-scores that varied by two *SEMs* or more from one administration to the next were considered significant.

Table 4. SRS treatment subscales data.

	T-score			
Treatment subscale	Pre	Post	Variance	2 *SEMs*
Social Awareness	59	59	0	14.2
Social Cognition	76	61	15	11.6
Social Communication	84	64	20	8.4
Social Motivation	66	49	17	11.4
Autistic Mannerisms	85	74	11	11

The results of this analysis revealed that significant treatment effects were found on four out of the five treatment subscales: Social Cognition, Social Communication, Social Motivation, and Autistic Mannerisms. The subscale with the greatest amount of change was Social Communication. The only subscale in which Steven was not rated as having made significant change is Social Awareness, as the pre-training and post-training score for this subscale remained the same.

SRS item analysis. Due to the broad scope of the SRS, many of the items did not directly relate to the focus of this study. As such, overall improvements in total score and treatment subscale scores may not have reflected actual changes in flexible thinking and behaviour in social situations, and rather may have been due to changes in Steven's mother's perception of his global social functioning. Following the initial analysis of the SRS total scores and treatment subscale scores, an analysis of the SRS items was undertaken to ascertain which questions were related to the specific focus of this study, and whether there were any changes in those items between the pre-training and post-training administrations of the measure.

All of the SRS items were reviewed and examined based on content, and items were pulled out which reflected the ability to think flexibly and behave flexibly in social situations (for example, taking turns when interacting with peers), as well as items that reflected material taught directly in the training program (for example, perspective taking). Of the 65 items on the SRS, 12 items were identified that related to the focus of this study. These items were drawn from four of the treatment subscales (Social Awareness, Social Cognition, Social Communication, and Autistic Mannerisms). The scores reported for each item are the raw scores generated from the ratings Steven's mother provided in the pre-training and post-training administrations of the SRS (refer to Table 5 for the 12 items and the raw scores). The raw scores are reported as opposed to the initial rating scores, as the raw score corrects for the reverse scored items, therefore making any pre-training to post-training differences more readily apparent when interpreting the data. The raw score for each item ranges from 0-3, and in comparing pre-training to post-training scores a lower post-training score indicates improvement.

Table 5. SRS items related to the focus of this study.

	Raw score	
Treatment subscale / item	Pre	Post
Social Awareness subscale		
7. Is aware of what others are thinking or feeling. *	3	2
Social Cognition subscale		
10. Takes things too literally and doesn't get the real meaning of a conversation.	2	1
17. Recognizes when something is unfair. *	1	0
Social Communication subscale		
12. Is able to communicate his or her feelings to others. *	2	2
13. Is awkward in turn-taking interactions with peers (e.g. doesn't seem to understand the give-and-take of conversations).	0	1
22. Plays appropriately with children his or her age. *	2	1
61. Is inflexible, has a hard time changing his or her mind.	2	1
Autistic Mannerisms subscale		
4. When under stress, he or she shows rigid or inflexible patterns of behaviour that seem odd.	1	1
24. Has more difficulty than other children with changes in his or her routine.	1	1
28. Thinks or talks about the same thing over and over.	2	2
31. Can't get his or her mind off something once he or she starts thinking about it.	3	2
39. Has an unusually narrow range of interests.	3	2
Total raw score	22	16
Mean raw score	1.83	1.33

* Reverse scored items; the raw score corrects for this reversal

Overall, the total raw score and mean raw score were lower on the post-training assessment, suggesting that Steven demonstrated improvement in social functioning with respect to the SRS items directly related to the focus of the training program. When the 12 items were examined on an item-by-item basis, Steven's mother's ratings were lower on the post-training assessment for seven of the items (items 7, 10, 17, 22, 31, 39, and 61), which indicated that he improved on those items over the duration of this study. For all of these seven items, the post-training rating was only one score lower than the pre-training rating. Although this does not appear to be a significant difference, the ratings are only out of 4 (0-3), ranging from "not true" to "almost always true," thereby indicating that she perceived a difference in Steven's behaviour on those items. Steven's mother's ratings remained the same for four of the items (items 4, 12, 24, and 28), which indicated that she did not perceive him as improving or worsening on those items. Finally, Steven's mother's rating was higher on the post-training assessment for one of the items (item 13: "Is awkward in turn-taking interactions with peers"), which indicated that he demonstrated worsening on that item over the duration of this study. As with the items demonstrating improvement, the post-training rating on this item was only one score higher than the pre-training rating.

Chapter 6: Discussion

The purpose of the present study was to examine the effectiveness of a social-cognitive training program based on the Superflex curriculum (Madrigal & Winner, 2008) for one individual with HFA, specifically with respect to whether participation in the training program resulted in meaningful changes in the individual's ability to think and behave flexibly in social situations. Steven participated in a 10-week training program, and several measures were conducted with Steven, Steven's mother and sister, Sarah, through the duration of this study to assess the effects of training program on Steven's behaviour. In this chapter the major findings of this study are outlined, specifically in connection to the hypotheses posed at the beginning of this study and the measures used, as well as in connection to previously published literature. Moreover, the implications of the findings are described. Lastly, the limitations of this study are presented, along with recommendations for further study in this area.

Hypotheses and Related Findings

Hypothesis 1.a. The first hypothesis posed at the beginning of this study was: *While participating in the training program, the participant would show measurable gains in flexible thinking within the training setting, as evidenced in direct observation of the participant's use of statements related to the vocabulary terms, concepts and strategies taught in the training program.* The findings of the direct observation data on the acquisition target behaviours within the training sessions provided evidence to support this hypothesis. The acquisition target behaviours were statements directly related to the vocabulary terms, concepts and strategies taught in the training program, and thus were related to flexible thinking in social situations. Overall, the findings indicated that

throughout the training program Steven emitted a high but variable level of prompted statements, and a gradually increasing level of spontaneous statements, which thereby suggested acquisition of the material taught within the training setting.

Despite this finding, it was unclear whether Steven's ability to use the language and materials taught within the training sessions was reflective of true understanding, or whether it was due to rote learning and recall. According to Lovett and Pillow (1995), memorization and comprehension are distinct mental processes. Memorizing and then recalling material does not necessarily equate to understanding the content of the material (Lovett & Pillow, 1995). Anecdotal evidence taken from the direct observation of videotapes from more than one training session suggested that Steven may not have always processed, comprehended and integrated the material, and rather he often quickly recalled the material from memory when prompted by the research team. For example, in one of the sessions Steven was asked to describe the "powers" each Unthinkable character had, as well as strategies to defeat the character. Steven seemed to have difficulty paraphrasing the material and rather he recited the material almost verbatim, and when he could not recall a strategy he made one up.

Hypothesis 1.b. The second hypothesis posed at the beginning of this study was: *While participating in the training program, the participant would engage in progressively more target expected behaviours and progressively fewer target unexpected behaviours within probes in the non-training setting, compared to baseline, as evidenced in direct observation of the participant while interacting with a familiar peer or sibling.* The findings of the direct observation data on the generalization target behaviours within the probe sessions in the non-training setting provided evidence to contradict this

hypothesis. When all of the direct observation data from the probe sessions were analyzed together, it became apparent that Steven made no meaningful changes in the target expected and unexpected behaviours when interacting with his sister. More specifically, he did not demonstrate an increase in the target expected behaviours following the implementation of the training program, nor did he demonstrate a decrease in unexpected behaviours following the implementation of the training program. This was the case both in comparison to the baseline data, as well as in comparison to the data obtained across the duration of this study. Further, for the majority of the sessions Steven engaged in more target unexpected behaviours than target expected behaviours. Overall this indicated that the training program had little control over the occurrence of the generalization target behaviours (Cooper et al., 2007).

Hypothesis 1.c. The third hypothesis posed at the beginning of this study was: *While participating in the training program, the participant would engage in more flexible behaviour in naturally occurring social situations and the quality of the participant's flexible behaviour would improve, as evidenced in weekly parent reports, and in pre-training and post-training interviews with the participant, the participant's parent, and the familiar peer or sibling.* The findings from the weekly parent reports and the interviews conducted with all three individuals provided evidence to both support and contradict this hypothesis. Starting with the findings of the weekly reports completed by Steven's mother, each week she was able to describe situations in which Steven was inflexible and flexible, however her reports revealed that Steven did not demonstrate improvements in the quality of his flexible behaviour, as the quality of his responses during the situations did not improve. However, on the rating questions on the parent

report form, Steven's mother's total score rating of Steven's flexibility in different contexts increased progressively by 33.33%, and her total score on the last weekly report was 73.33%. Further, in her additional comments she stated that she believed Steven had made "definite improvements" related to his thinking and behaviour in social situations, including when he interacted with Sarah.

With respect to the pre-training and post-training interviews with Steven, Steven's mother and Sarah, the findings were somewhat inconsistent. Both Steven and Sarah had difficulty describing social situations in which Steven was flexible. As mentioned in the Results chapter, three reasons were postulated to explain why Steven and Sarah experienced challenges with answering the interview questions about Steven's behaviour. First, Steven and Sarah may not have fully understood the concepts of "inflexible" and "flexible," thereby impacting their answers. Second, due to the abstract nature of these concepts and the age of both Steven and Sarah, they may have lacked the ability to recall and reflect on behaviours that had happened in the past. Third, Steven may not have engaged in flexible behaviour, and thereby Steven was unable to answer the questions, and Sarah discussed the situation that she could think of at the time, even though it involved her being flexible, while Steven remained inflexible.

In contrast, Steven's mother was able to describe situations in which Steven was inflexible and flexible. She had stated that she made use of the vocabulary terms and concepts taught in the training program to trigger Steven to change his behaviour when he was being inflexible. Moreover, in the post-training interview she reported that she had noticed an improvement in Steven's ability to be flexible in peer interactions, including with Sarah, and she expressed that Steven had become more mature and better

at handling situations over the past three months. Her pre-training to post-training rating on Steven's level of flexibility improved by 45%, and she rated the effectiveness of the program an eight in helping Steven become more flexible. However, she also reported that Steven was still inflexible within the context of his conversations with others.

Hypothesis 2.a. Finally, the fourth hypothesis posed at the beginning of this study was: *Despite increases in statements related to the training material, and gradual changes observed in target expected and unexpected behaviours while participating in the training program, the changes would not be meaningful until the behavioural contingency plan was added to the training program.* The behavioural contingency plan was implemented in the third phase of the training program. The findings of the direct observation data on the acquisition target behaviours within the training sessions provided some evidence to support this hypothesis, whereas the findings of the direct observation data on the generalization target behaviours within the probe sessions in the non-training setting provided evidence to contradict this hypothesis. With respect to the acquisition target behaviours, the frequency of the prompted statements remained high and variable across all three phases of the training program. However, the frequency of the spontaneous statements increased progressively across the training phases, and there was a considerably higher frequency of spontaneous statements in the third phase of the training program when the behavioural contingency plan had been added. However, it is possible that this increase was due to repeated exposure, rather than the addition of the behavioural contingency plan.

Although it is discussed above that anecdotally it appeared as though at times Steven had memorized the training material and that he may not have truly understood

the material, there was also anecdotal evidence within the third phase of the training program that suggested this was not the case. Delayed video feedback and reinforcement were incorporated within the behavioural contingency plan, and when Steven watched the videotapes of Sarah and himself interacting in the non-training setting, he was able to appropriately apply the vocabulary terms, concepts and strategies taught in the training program to the specific situation and his behaviour. As such, by the third phase of the training program he demonstrated that he was able to comprehend and integrate the material, thus suggestive of an increased ability to think flexibly.

Conversely, with respect to the generalization target behaviours, as described for hypothesis 1.b, Steven did not demonstrate meaningful changes in the target expected and unexpected behaviours in any of the condition phases, including the third phase of the training program. When the generalization target behaviours data were examined specifically to determine whether there were differences across the condition phases, it appeared as though the addition of the behavioural contingency plan in phase three of the training program did not have an impact on Steven's behaviour in the non-training setting, as the data remained highly variable in the third phase of the training program. This is particularly important to note, as in the third phase of the training program Steven was reinforced for his behaviour while watching the videotapes of his interactions with Sarah, however he was unable to use this feedback to control his behaviour and be more flexible in his interactions in the probe sessions the following day. It is possible that this was due to a an inability to remember and generalize the training material and feedback from the training setting to a more natural context, despite the behavioural contingencies in place, or that he was truly not able to comprehend the training material.

Additional Findings

Social Responsiveness Scale (SRS). The parent version of the SRS was administered in the pre-training and post-training assessments to measure whether the training program had an overall impact on Steven's social competence. The pre-training to post-training SRS findings were significant. Comparison of the pre-training and post-training total scores reported by Steven's mother indicated that his social competence improved from the severe range of impairment to the mild to moderate range of impairment. Further, based on her ratings, significant treatment effects were found on four out of the five treatment subscales. Finally, the item analysis conducted to examine the SRS items directly related to this study revealed that Steven's mother's ratings indicated that he improved on over half of those specific items as well.

ABC assessment. The ABC assessment was conducted to investigate the triggers for Steven's unexpected behaviours in the probe sessions. Anecdotal evidence from the direct observation of probe session videotapes suggested that Sarah was the trigger for most of Steven's unexpected behaviour, in that his behaviour was in reaction to her behaviour (for example, her attitude or mood at the time, and if she had advanced in the game they were engaging in). However, a consistent pattern was found in the ABC assessment data, in that the majority of Steven's unexpected behaviours were triggered by his need to be in control within the situation and an overall insistence on doing things his way. As such, Steven's behaviour was clearly reflective of challenges with inflexibility in social situations.

Relations Between Findings and Measures

Flexible thinking. When the findings were examined across the measures utilized in this study inconsistencies emerged with respect to whether Steven showed measurable gains in his ability to think flexibly, specifically with respect to whether he learned and made use of the vocabulary terms, concepts and strategies taught in the training program. The direct observation data on the acquisition target behaviours within the training setting revealed that Steven's spontaneous use of the material increased. It was questioned whether Steven comprehended this material, or whether he memorized and recalled it based on rote learning. As described above, both of these positions were supported by anecdotal evidence.

Data from the weekly parent reports and the interviews suggested that any gains in flexible thinking Steven made in the training setting did not transfer to changes in Steven's flexible thinking in the natural environment, as his ability to behave flexibly in social situations did not appear to increase. Based on the findings of both the weekly parent reports and Steven's mother's post-training interview, Steven did not make use of the vocabulary terms, concepts and strategies during naturally occurring social situations. Furthermore, in Steven's post-training interview he had some difficulty discussing the material taught in the training program, as it appeared that he was unable to retrieve or recall the information.

Steven's mother's pre-training and post-training rating on the Social Awareness treatment subscale of the SRS remained the same, which was consistent with the observations made with respect to Steven's lack of improvement during the social

awareness phase of the training program, as well as his lack of awareness with respect to how his behaviour had an impact on Sarah.

Flexible behaviour. Moreover, when the findings were examined across the measures utilized in this study inconsistencies emerged with respect to whether Steven showed measurable gains in his flexible behaviour in social situations within the natural environment. Despite potential improvements in flexible thinking, Steven's ability to think flexibly did not naturally generalize to Steven's ability to behave flexibly. This lack of correspondence was found when comparing the findings of the direct observation data on the acquisition target behaviours in the training setting to the direct observation data on the generalization target behaviours in the non-training setting.

Additional inconsistencies in this area were found when the direct observation data on the generalization target behaviours was compared to the other measures. More specifically, Steven did not demonstrate improvements in his flexible behaviour in the direct observation probe sessions with his sister, which is somewhat consistent with the findings from Steven and Sarah's post-training interview. However, on the weekly parent report forms and the post-training interview Steven's mother indicated that she perceived that there had been improvements in Steven's flexible behaviour over the duration of this study.

Although Steven's mother reported improvements in the parent reports and interviews that stand in contradiction to the direct observation data, the type of behaviours she reported specifically on the Significant Upsets and Inflexibility Recording Form can be seen to support the findings of the direct observation data on the unexpected generalization target behaviours. On both measures Steven was observed engaging in

similar behaviours, including insisting on doing things his way, refusal behaviours, and aggression towards others. The data obtained from Steven's mother on this form revealed that the pattern of behaviour observed in the direct observation probes was consistent with Steven's behaviour during naturally occurring daily situations, and that each week he continued to behave inflexibly in the natural environment over the duration of this study.

Social competence. Steven's mother reported significant treatment effects and improvements in Steven's overall social functioning on the SRS. This finding is fairly consistent with the parent report data gathered from the weekly report forms and the interviews, in that Steven's mother indicated that the training program was a positive experience and that Steven demonstrated changes in his behaviour. However, as with the parent report data on Steven's flexible behaviour, this finding is inconsistent with the direct observation data on the generalization target behaviours in the non-training setting. It is possible that this discrepancy is due to different perspectives of what flexible behaviour looks like. What Steven's mother is observing and reporting as flexible behaviour on the weekly reports, interviews and SRS may be considerably different from the perspective of the investigator and the specific target behaviours measured in the direct observation probes. If this is the case, at the beginning of this study the concepts of flexible and inflexible behaviour should have been more clearly defined.

It is important to note that in the SRS item analysis it was revealed that Steven's mother's ratings indicated that Steven worsened on the item related specifically to turn taking, which was a skill that Steven repeatedly demonstrated difficulty with over the duration of this study in the direct observation probe sessions.

Aggression. Although aggression was not the primary focus of this study, aggression was one of the target unexpected behaviours that were measured within the probe sessions in the non-training setting. Aggression was coded in the majority of the probe sessions, to different extents across session. However, it was not until the data from the weekly parent report forms and the interviews had been analyzed that it became apparent how aggressive Steven was when he interacted with Sarah.

With respect to the Significant Upsets and Inflexibility Recording Form that Steven's mother completed each week, several of the situations that she described included aggression. This was the case so much so that for analysis the data on aggression was pulled out of the "inappropriate actions" category and was made into its own category of behaviour.

With respect to the pre-training and post-training interviews, fighting was a common topic of discussion for all three individuals, including when asked to describe situations in which Steven had been inflexible and flexible, and to answer probe questions regarding those situations. Most notably, during the post-training interviews Sarah emphasized that Steven frequently hurt her when he was upset or frustrated, as well as that she often had to calm Steven down and be flexible herself in order to avoid getting hurt. She indicated that Steven had been aggressive towards her long before the start of this study (for example, a few years ago, there was an incident where his aggression almost led to her going to hospital). Sarah's responses during the interview suggested that she had been traumatized by that incident, and that she tried very hard to accommodate Steven to avoid similar incidents. It is likely that Steven's history of aggression and

Sarah's pattern of coping and responding was ingrained in their relationship, whereby Steven had learned that he could control Sarah's behaviour through anger and aggression.

Connections to Previous Research

Social Thinking research. The foundational background of the Superflex curriculum is the Social Thinking intervention approach. As described in the Literature Review, despite wide use, only two research studies have been published examining the effectiveness of the Social Thinking curriculum and resources (Crooke et al., 2008; Lee et al., 2009). Overall, these two research studies were used to guide the development of this study. Several similarities and differences between this study and the previous research on Social Thinking exist. The most obvious difference is that the previous research examined the effectiveness of training programs utilizing the Social Thinking curriculum, whereas this study focused primarily on the Superflex curriculum and supplementary materials, making use of the Social Thinking curriculum in only the first phase of the training program. While Crooke et al. and Lee et al. implemented the training program in a group format, in this study the training program was delivered in an individual format. The participants in the study conducted by Crooke et al. had higher IQ scores compared to the participant in this study. It is unclear whether there was a difference in Steven's IQ score compared to that of participants in the study conducted by Lee et al., as specific information on IQ was not provided. The dependent variables of the previous research were social exchanges (Crooke et al., 2008) and social communication (Lee et al., 2009), whereas this study addressed flexible thinking and flexible behaviour in social situations.

Measures. Despite differing dependent variables, this study replicated the study conducted by Crooke et al. (2008) in that flexible social behaviour was measured by

selecting a number of target expected and unexpected behaviours, which were broken down into verbal and nonverbal outputs. In both studies these target behaviours were measured using direct observation via videotape recordings. Further, as in the study conducted by Crooke et al., the expected and unexpected targets were measured in a non-training setting as an intervention outcome measure, as well as a direct measure of generalization. However, in Crooke et al., the non-training setting was a university clinic that was described as a "non-structured, non-treatment environment" (Crooke et al., 2008, p. 584), whereas the non-training setting in this study was the participant's home, which was a more natural environment to measure generalization. Similarly, unlike in Crooke et al., where the same peers were present in both the training and non-training settings, in this study Sarah was not present in the training setting, and rather she was only involved in the non-training setting.

Further, similar measures were utilized in this study as those used in the study conducted by Lee et al. (2009). In both studies pre-training and post-training semi-structured interviews were administered with the participants and the participants' parent. However in this study data was also gathered from the participant's sibling in the post-training interview. Although different in nature, both studies also used a behaviour rating scale assessment pre-training and post-training to obtain data. In the study conducted by Lee et al. the parents, teachers and social workers of the participants completed the rating scale, whereas in this study only the parent completed the measure. A major strength of the study conducted by Lee et al. was the use of multiple informants on the behavioural rating scale, however the scores from each informant were combined to obtain a mean score, instead of allowing for comparisons across informants.

Findings. Despite the similar foundational background, due to differences in the curricula used and the dependent variables, there are limits to the comparisons that can be made with respect to the findings of this study and the findings of previously published research on Social Thinking. Overall, the findings of previous research on Social Thinking provided preliminary support for the effectiveness of this approach. In contrast, the findings of this study were inconsistent, thereby providing a mixed conclusion on the effectiveness of the training program under investigation. Unlike Crooke et al. (2008), significant improvements in the participant's expected and unexpected behaviours were not found in the direct observation data in this study. However, similar to Lee et al. (2009), in this study the data obtained from the parent interviews revealed that the participant's parent perceived improvement in the participant's behaviour from the beginning to the end of the training program. Differences in research methodology may account for why Crooke et al. and Lee et al. obtained positive results whereas positive results were not consistently found in this study. This could include the use of pre-post measures versus data collection over the duration of the study, as well as the format of the training program being group versus individual-based.

Of particular importance, the findings of this study are somewhat inconsistent with the findings of the previously published research on Social Thinking with respect to generalization. Notwithstanding the limitations of the studies conducted by Crooke et al. (2008) and Lee et al. (2009), both studies provided evidence to suggest that the material taught in the Social Thinking training setting generalized to increased performance of related social behaviours outside of the training setting. Both of these studies supported Winner's (2008a, 2008b) claims that teaching social knowledge in the training setting

will naturally lead to increases in related socially appropriate behaviours in novel situations within varied social contexts. Overall, natural generalization from increased social knowledge to increases in related social behaviours was not supported in this study. This conclusion is based on the lack of correspondence between the findings on each of the measures utilized. This was specifically apparent when the direct observation data in the training setting were compared to the direct observation data in the non-training setting, and when the direct observation data in the non-training setting were compared to the informant-report data.

Social interventions and generalization. Although the findings of this study were not consistent with the findings of the previously published research on Social Thinking, the finding were in line with the body of literature on social interventions for individuals with ASD, particularly with respect to the issue of generalization. A number of researchers have concluded that a major limitation of social skill-based and social-cognitive interventions for individuals with ASD is limited generalization of targeted behaviours from the intervention setting to natural environments (Barry et al., 2003; Gresham et al., 2001; Matson et al., 2007). Further, Schreiber (2001) concluded that despite the potential effectiveness of cognitive-behavioural based social interventions for individuals with HFA, the ability to use knowledge acquired in the intervention has not been shown to transfer to naturalistic social situations. As the result of previous research findings, recommendations for increasing generalization have been posed by several researchers, including the importance of adequately programming for generalization in the intervention using multiple strategies, and explicitly measuring generalization using

direct observation (Gresham et al., 2001; Griffiths et al., 1997; Openden et al., 2009; Stokes & Baer, 1997).

This study made use of direct observation in the participant's home to measure whether generalization occurred, however only two strategies were programmed into the training to promote generalization: encouraging the participant's parents to use the vocabulary terms and strategies taught in the training program within the natural environment, and the inclusion of a weekly homework task for the participant to complete. Both of these strategies were taken from the curriculum manual (Madrigal & Winner, 2008) and the previously published research on Social Thinking (Crooke et al., 2008; Lee et al., 2009). The decision to not program additional strategies for generalization in this study was intentional so as to be consistent with the curriculum manual and previous research on Social Thinking, as one of the aims of this study was to investigate the effectiveness of the curriculum and supplementary resources as they were developed and used in Winner's work. The failure to find consistently positive results in this study can be seen to support previous research findings that generalization is limited without the addition of multiple generalization strategies within any social intervention for individuals with ASD.

Sibling relationships and aggression. Due to the extent of Steven's aggressive behaviour towards Sarah apparent in the observational and sibling report findings of this study, previous research on sibling relationships was examined to determine whether other researchers had identified a similar pattern of behaviour. Overall, sibling relationships are complex in nature. Discrepancies have been found in previous research with respect to the quality of the sibling relationship when one child has a disability,

including children with ASD (as reviewed in Rivers & Stoneman, 2003; Stoneman, 2001). An abundance of research has suggested that the relationship between children with disabilities and their siblings is more positive and nurturing than the relationship between comparison typically developing sibling pairs (Stoneman, 2001). Further, this finding has been consistently demonstrated through direct observation data, and in parent and sibling report data (Stoneman, 2001). In contrast, mixed findings have emerged with respect to the degree of conflict between siblings when one child has a disability compared to between typically developing siblings, with some research studies indicating more conflict and other research studies indicating less conflict when the two groups are compared (Rivers & Stoneman, 2003; Stoneman, 2001).

Ross and Cuskelly (2006) conducted a research study examining interaction problems between typically developing children and their siblings with ASD. Twenty-five typically developing children with a sibling with ASD participated in the study. Participant-report data were obtained on a measure that addressed the participants' knowledge of ASD, and on a measure that addressed interaction problems the participants' had experienced with their sibling and the coping strategies used in response to the problems. The findings indicated that 84% of the participants reported aggression as a concerning interaction problem between siblings, and aggression was the most common problem identified. However, Ross and Cuskelly did not include a comparison group of typically developing siblings pairs, and thereby stated that it was not clear whether the predominance of aggression was specific to sibling pairs when one child has ASD, or if aggression was also common in sibling pairs when both children are typically developing.

Findings of early research on typically developing siblings has suggested that between 8 and 11 years of age the sibling relationship changes, as siblings in middle to late childhood tend to spend more time together, and they often engage in more cooperation and more conflict with one another (Vandell, Minnett, & Santrock, 1987). Further, numerous researchers have concluded that conflict and aggressive behaviours are more frequent and intense among siblings with one to three years age difference between the children, whereas positive behaviours are more frequent among siblings with a larger age difference (Epkins & Dedmon, 1999).

The findings of this study are consistent with the literature on sibling relationships in that it was clear that Steven and Sarah's relationship was very complex. Data from the interviews and anecdotal evidence from the direct observation probes in the non-training setting revealed that Steven and Sarah did enjoy spending time together and they had a close relationship. However, Steven was frequently aggressive towards Sarah, sometimes intensely, and therefore conflict between the siblings was a significant area of concern for the family. Although the pattern observed in this study, where Steven attempted to control Sarah's behaviour and interaction outcomes through aggression, has not been addressed specifically in previous research, it is easy to see how this pattern might have been intermittently reinforced over time, where aggression would lead to Steven getting his way.

Extensions of Previous Research

Superflex and the team of Unthinkables. To-date, no published research has been conducted examining the effectiveness of the Superflex curriculum (Madrigal & Winner, 2008). As such, this study served as a first step in validating the Superflex

curriculum and supplementary materials. The training program in this study made use of selected lesson plans outlined in the Superflex curriculum, and over the duration of this study measurement tools were employed to examine whether or not the training program resulted in beneficial gains in the participant's flexible thinking and related flexible behaviour. Although the conclusions that can be drawn from this study are limited, due to the inconsistencies in the findings and the methodological weaknesses addressed below, this study extended the body of literature on social-cognitive interventions for individuals with HFA and AS, including the Social Thinking intervention approach.

Furthermore, previous research has suggested that children may be receptive to the use of superheroes in intervention settings, as superheroes are popular cultural figures, and often children can identify with superheroes (Nelson, 2007). Regardless of the mixed findings of this study, it became apparent almost immediately that Superflex and the Team of Unthinkables had captivated Steven. He wanted to know everything about what the characters could do, and he had stated in one of the first training sessions that he wanted extra handouts so that he could bring them to school to show his teacher and his friends.

Social Thinking research. Winner (2008a) is a proponent of social-cognitive interventions, Social Thinking in particular, and as described in the Literature Review, she has expressed concerns with ABA and the use of social skill-based interventions for individuals with HFA and AS. Despite her standpoint, in one of her books she stated the following:

> This author believes that a synergy integrating principles of applied behaviour analysis into cognitive behavioural and mental health teachings is possible.

> Perhaps this will emerge as the basis for evidence-based social skills programs for individuals with ASD, especially those with higher cognitive and linguistic skills (Winner, 2008a, p. 18-19)

In line with this notion, this study extended previous research on Social Thinking through the addition of a behavioural contingency plan. The purpose of the third phase of the training program was to examine whether combining the social-cognitive intervention with behavioural strategies (i.e. a token economy) resulted in more meaningful gains as compared to those made within the social-cognitive intervention alone. However, the overall impact of combining the Superflex curriculum and a behavioural contingency plan is still unclear. Replication of this methodology across more individuals with HFA and AS using a multiple baseline design is warranted, as it would allow for greater clarity on the overall effects of integrating the Superflex curriculum and behavioural strategies.

With respect to the previously published research on Social Thinking, this study extended beyond the studies conducted by Crooke et al. (2008) and Lee et al. (2009) by making use of a research design that allowed for more extensive measurement of training outcomes and generalization to the natural environment. Both Crooke et al. and Lee et al. used a pre-post design, wherein they reported data from assessments that had been administered before the start of the training program and again following the completion of the training program. In addition to employing pre-post measures, this study utilized a single-subject, within-series A / B / C / C + D design. The target behaviours were measured weekly over the entire duration of the training program, which allowed for analysis of the data over time. This is useful, as it provides valuable information on

progress made throughout the training program, and to determine whether there were any improvements specific to each phase condition.

Furthermore, compared to the previously published research on Social Thinking, this study extended the length of the training program from eight sessions to ten sessions. This decision was made to accommodate the amount of material that was to be addressed within the training program, as recommended by Lee et al. (2009). Based on the data obtained from the post-training interview with one of the parents, Lee et al. indicated that the frequency and duration of the training program may have been insufficient, and that an increased number of sessions would allow for more in-depth discussion on the content. If time had permitted in this study, additional training sessions may have been useful for Steven's progress, particularly with respect to promoting generalization.

Measures. Of considerable importance, this study extended upon the two research studies published on Social Thinking, as well as much of the research on social-cognitive interventions for individuals with ASD, with respect to the measurement tools utilized. Unlike Crooke et al. (2008), who only collected data through direct observation, and unlike Lee et al. (2009), who relied on informant-report data from two measures, this study made use of several measures to evaluate the impact of the training program.

Data triangulation refers to the use of multiple and varied data-collection sources within a study to investigate the same concept or phenomenon (Berg, 2007; Brantlinger, Jimenez, Klingner, Pugach, & Richardson, 2005). Data triangulation typically involves the use of at least three data-collection sources, and it is employed as a means of validating findings by obtaining "multiple lines of sight" (Berg, 2007, p. 5; Brantlinger et al., 2005). This study made use of multiple and varied data-collection sources, including

direct observation in two settings, weekly parent report forms, interviews conducted with three informants, and a behaviour rating scale. As such, the findings from this study were drawn from analyzes made within and across several measures. Further, although the findings were inconsistent, this study allowed for data to be gathered from different perspectives, thereby obtaining a more comprehensive picture of Steven's flexible thinking and related behaviour, as well as the effectiveness of the training program.

This study extended those preceding it by measuring the participant's acquisition of the training material within each training session, as opposed to assuming that acquisition occurred based on the findings of pre-training to post-training measures on related social behaviour. Additionally, this study measured maintenance of the generalization target behaviours by including a one-month follow-up probe session. Further, while Crooke et al. (2008) and Lee et al. (2009) had stated that the training program under investigation had been designed using the principles of Social Thinking, including lesson plans from the curriculum, this study outlined specifically which lesson plans were used and measured treatment integrity to ensure adherence to the lesson plans and training schedule.

Implications of the Findings

This study served as a pilot study, which attempted to address some of the methodological limitations of the previously published research on Social Thinking and to initiate investigation of the Superflex curriculum within a research context. As this study only included one participant, further replication using single-subject or group designs with stronger experimental control is warranted. Future research should specifically examine the utility of combining the Social Thinking and Superflex curricula

with behavioural strategies to reinforce acquisition and generalization, as well as the impact of programming additional strategies into the intervention to promote generalization. Until more research has been conducted to examine the effectiveness of this approach, caution should be taken when using the Social Thinking and Superflex curricula within clinical practice. Implementation should involve monitoring and continued evaluation at the individual-level to examine the impact of the intervention.

As highlighted above, this study demonstrated the importance of data triangulation, both when selecting measurement tools and when drawing conclusions on the data gathered from the selected tools. Further, the findings from this study refuted the claims made by Winner (2008a) with respect to natural generalization. As such, this study supported previous research on social interventions for individuals with ASD with respect to emphasizing the importance of incorporating multiple strategies in the training program that directly target generalization to the natural environment.

It should be stated that near 0% levels of target unexpected behaviours were not anticipated, nor were near 100% levels of target expected behaviours. Although a comparison sample of typically developing children was not employed, it is fairly safe to say that no 10-year-old child, with or without HFA, is always flexible in social interactions. Despite this, a meaningful reduction in the target unexpected behaviours and an increase in the target expected behaviours was anticipated, and unfortunately, this was not apparent in the findings of the direct observation probes in the non-training setting.

Additional underlying social deficits. The findings of this study provided evidence to both support and refute the effectiveness of a training program using the Superflex curriculum and supplementary resources as a social-cognitive intervention for

one individual with HFA. A potential explanation for the inconsistencies in the findings is that the approach taken in the training program to address the target behaviours may have been too narrow. It is possible that the Superflex curriculum touched only the tip of the iceberg with respect to addressing the underlying social problems Steven faced. Although the target behaviours in this study were flexible thinking and flexible behaviour, the challenges Steven exhibited with respect to being flexible in social situations could have also been described as challenges related to social problem solving, emotional and behavioural self-regulation, empathy, and sportsmanship.

For example, poor social problem solving skills may have contributed to Steven's inflexibility while he engaged in games with Sarah during the direct observation probe sessions. Research has demonstrated that many individuals with HFA and AS acquire unconventional problem solving strategies, and if such strategies cannot be applied to a particular problem, these individuals frequently respond by withdrawing or by engaging in tantrums and/or aggression to cope with the situation (Bernard-Opitz, Sriram, & Nakhoda-Sapuan, 2001). Moreover, individuals with HFA and AS often employ problem solving strategies that are socially inappropriate and less likely to be effective, as their solutions are immature, bizarre, hostile and extreme (Channon, Charman, Heap, Crawford, and Rios, 2001). Although the Superflex curriculum provides social-cognitive strategies to become more flexible, few of the strategies are directly related to effective problem solving. As such, the Superflex curriculum may not adequately address different points of view with respect to flexibility. If different perspectives had been taken into consideration and had been incorporated into the training program, this potentially would

have led to a different approach to the target behaviours, and to the intervention and data analysis methods, which may have had a more positive effect on Steven's behaviour.

Limitations of this Study and Recommendations for Future Research

Several limitations of this study were evident and warrant discussion. Further, the findings and limitations of this study unveiled important areas of focus for future research.

Research design. First and foremost, the findings of this study cannot be used to identify a cause-effect relationship between the training program and any changes in the target behaviours. Along this line, the findings of this study may not be generalizable to other individuals with HFA or AS. This limitation resulted from the research design utilized, as well as the inclusion of only one participant. As such, the conclusions drawn from this study are limited to examining *Steven's* response to the Superflex curriculum and the impact the training program had on *his* flexible thinking and behaviour. Conclusions on the effectiveness of the Superflex curriculum as a whole, or as implemented with other individuals with HFA and AS would be a premature over-generalization and potentially inaccurate.

This limitation was inherent from the beginning, due to the explorative nature of this study as a case-study pilot for future research on Social Thinking and Superflex curricula. It is important to note that this is also a considerable limitation of the previously published research on Social Thinking. As such, it is highly recommended that future research studies on both the Social Thinking and Superflex curricula employ stronger research designs. More specifically, future research studies should be conducted

using either a multiple baseline design across several participants, or a randomized clinical trial (RCT) with a treatment group and a wait-list comparison group.

Measures. Several of the limitations of this study are related to the measurement tools utilized. First, for the purposes of this study the investigator developed the coding scheme for the acquisition target behaviours and the generalization target behaviours, as well as the weekly parent report forms and the interview questions. The reliability and validity of these measures was not investigated, nor were the measures field-tested for appropriateness prior to being used in this study. As such, there are limits to the conclusions that can be drawn from the findings of these measures. However, few published studies have examined behavioural observation and interview protocols for consistent and reliable assessment of social functioning in children (Merrell, 2001). Further, little research has been conducted on flexible thinking and the Superflex curriculum; therefore no previously published measures had been developed for use in this study. Future research should address this limitation by developing and validating interview and direct observation tools that are specific to individuals with HFA and AS and that directly target flexible thinking and related flexible behaviour in social situations. It would be a significant step in improving the quality of social skills and Social Thinking research if there were valid and reliable measures to make comparisons across research studies.

On a related note, a second limitation with respect to measurement is the coding scheme used for the acquisition target behaviours. The acquisition target behaviours were measured through direct observation in the training sessions to examine whether the participant learned and made use of the vocabulary terms, concepts and strategies taught,

thereby suggesting flexible thinking. However, retrospectively it became evident that the coding scheme measured the frequency at which Steven used the language, whereas it would have been more informative if the coding scheme had measured Steven's comprehension of the material. To some extent the data collected in the training sessions on the frequency of the acquisition target behaviours reflected opportunity to respond, rather than understanding of the vocabulary and skills being taught. The frequency of both the prompted and spontaneous statements was dependent on the number of opportunities provided by the research team for Steven to use the language. Each week the number of opportunities varied, due to differences in activities and schedule for each of the training sessions, and due to the behaviour of the research team. Based on anecdotal evidence from the training session videotapes, often the research team prompted Steven before he had much time to respond on his own, thereby limiting the frequency of his spontaneous statements. It is possible that if the research team talked less and waited longer for Steven to respond, he may have emitted more spontaneous statements.

Further, while the IOA data for the frequency of the prompted statements was very strong, the IOA data for the frequency of the spontaneous statements was poor. This may have been due to a lack of clarity as to what constituted a spontaneous statement, thus allowing for subjective judgments on the part of the coders. Similarly, the investigator had greater knowledge of the material addressed in the training program, and thus was able to identify statements related to the acquisition target behaviours more readily, whereas the RA had less exposure to the material and may not have received enough training on differentiating spontaneous statements.

When measuring acquisition in future research studies on social-cognitive interventions for individuals with HFA and AS, permanent products should be used to measure comprehension of the material, such as the participant's performance on a weekly quiz or a homework task. Or, a consistent number of opportunities to use the training vocabulary should be presented across all of the training sessions to investigate whether the participant's responses change over the duration of the training program. In addition to obtaining a more accurate measure of acquisition, both of these recommendations would likely increase validity and reliability of the data.

Similarly, a third limitation with respect to measurement is the coding scheme used for the generalization target behaviours. Although the target codes were all clearly defined, a few of the target codes were not mutually exclusive. For example, two of the target codes for the verbal unexpected behaviours were control comments (V.1) and refusal comments (V.2), and often Steven engaged in behaviours that fit the definition of both of these target codes. At times it was difficult to distinguish which target code to record, which led to some degree of subjective judgment. This limitation had an impact on the data gathered in the direct observation sessions, as well as on the IOA data. As this study was a pilot study for further research on the Superflex curriculum, this is an issue that needs to be corrected in future coding. If the same, or a similar, coding scheme is used, some of the target codes should be collapsed to ensure mutual exclusivity, and the target codes should be more clearly defined to avoid coding based on subjective judgment.

Although IOA on the generalization target behaviours was acceptable, as the mean score for each category was above 80, IOA could have been stronger if there had

not been limits to the coding scheme. The coding scheme for the generalization target behaviours may have been too cumbersome, as there were 17 target codes between the expected and unexpected behaviours. As such, within a 15-second interval, the observer was required to pay attention to, and then record, multiple behaviours that may have been occurring simultaneously. The observers were free to review the video as much as needed, however, they typically reviewed the videos no more than twice due to time constraints. Retrospectively, not all of the target codes actually captured flexible and inflexible social behaviour (for example, engaging comments and grunting, respectively), and these codes could be excluded in future research to make the coding scheme easier to manage and more reflective of the generalization target behaviours.

A fourth limitation with respect to measurement is related to the use of parent-report data. Steven's mother completed the SRS, the interviews, and the weekly parent report forms. While it is important to obtain parent-report data, Steven's mother may have been biased in her reporting due to her active involvement in the training program, and due to her positive expectations of the outcome (Gevers et al., 2006). To counterbalance for the possible occurrence of biased reporting, and to corroborate reports, data should be gathered from multiple informants, including the participant, both parents, and teachers (Gevers et al., 2006; Merrell, 2001). Although the interviews were administered with multiple informants, including Steven, Steven's mother and his sister Sarah, a limitation of this study is that data were not gathered from Steven's father or his teachers. This would have provided richer data from several different perspectives, and would have corrected for Steven's mother's more limited view given that she was not always home before or after school to see how Steven behaved, due to full-time work

commitments. Future research in this area should include data collected from the participant's mother and father, as well as from teachers and/or educational assistants. According to Constantino et al. (2007), teacher-report data is particularly informative, as teachers routinely observe the participant while engaging in naturally occurring social interactions with peers. Furthermore, teachers are often more proficient than parents in understanding what constitutes as typical social behaviour given the breadth of their experience (Constantino et al., 2007).

Cognitive functioning. A potential limitation of this study is the participant's level of cognitive functioning. During both the training program and the administration of the measures, at times it appeared as though Steven had difficulty understanding the material or the questions asked of him. It is speculated that Steven did not understand the rating scale questions asked in the interviews, in that he was unable to conceptualize what the rating scale meant. Only two anchors were provided, and they were not sufficiently defined. As such, any rating scale questions posed in measures employed in future research should involve several anchors that are clearly defined, and visuals should be used to aid in understanding.

Of particular importance, Steven had considerable difficulty reflecting on past behaviours and situations. This challenge likely impacted Steven's ability to apply what he had learned in previous training sessions to novel situations in his daily social interactions. Further, this challenge likely impacted the data gathered from the direct observations in the training setting, as well as the data gathered from Steven's interviews. It is important to note that the post-training assessments had been delayed by a week and

a half due to the family going on vacation, which may have contributed to Steven's hesitance and uncertainty when answering the interview questions.

Although Steven's estimated full scale and verbal comprehension IQ scores were above the cut-off score for inclusion in this study (IQ of 80), his scores still fell within the low-average range. In the Superflex curriculum manual Madrigal and Winner (2008) indicated that the curriculum and materials were appropriate for children with a verbal IQ of 70 or above. As such, the IQ cut-off score for inclusion in this study was higher than the cut-off IQ score suggested in the curriculum manual. Future research should investigate whether the Superflex curriculum is more appropriate for individuals with full scale and verbal comprehension IQ scores above 85, which was the cut-off used in the study conducted by Crooke et al. (2008).

Training program. A limitation of the training program implemented in this study is that it was delivered on an individual basis. The lesson plans in the Social Thinking and Superflex curricula are designed for training in a group format, and as such, were adapted to fit with the individual training format. The use of a single subject design was related to the fact that this study was intended to be explorative in nature, serving as a pilot study on methodology to guide future research. It is likely that the findings of this study would have been different if it involved group training, as this would have permitted for different types of activities and discussions, and the opportunity for vicarious learning. Future research should explore whether there are differences between individual-based and group-based training programs using the curricula under investigation, to identify whether there are any added benefits of the group format and whether there is an impact on the outcome of the training program.

Additionally, although this study extended the length of the training program compared to previously published research on Social Thinking training programs, it is possible that the duration was still too short, at least for this participant. According to Spence (2003), ensuring adequate duration of training is one of the recommended methods for enhancing the outcomes of a social intervention. Future research should examine whether more beneficial improvements in behaviour emerge from a training program on the Superflex curriculum that is several months rather than several weeks in length, as well as from a training that is delivered on an ongoing, day-to-day basis rather than brief, specific clinic sessions (Spence, 2003).

Maintenance and generalization. As highlighted throughout this chapter, the findings of this study are mixed with respect to the outcomes of the training program, as well as whether or not generalization occurred, both from the training setting to the natural environment, and from social knowledge and flexible thinking to related flexible behaviour. Although there was some evidence to suggest that the training program was effective and that generalization had occurred, the inconsistencies across the measures are a major limitation of this study. Data triangulation across measures, including data obtained from multiple informants, did not validate the specific findings of each of the measures.

Overall, it is recommended that maintenance and generalization should be the primary focus of all future research conducted on social interventions for individuals with HFA and AS, including training programs that utilize the Social Thinking and Superflex curricula. This can be done in several ways. First, the discussions and activities in the training sessions should be more in-depth, making stronger connections between the

training material and specific behaviours that the participant engages in during daily interactions with others. Second, training should extend into the participant's natural environment (Schreiber, 2011; Spence, 2003). This should involve in vivo practice, whereby the participant is exposed to real-life social situations with a peer or sibling and the trainer or research team provides prompting and scaffolding as needed, which is gradually faded until the participant is able to consistently demonstrate appropriate and flexible behaviour (Schreiber, 2011). Third, a parent training and sibling/peer training component should be added to the training program. Instead of simply providing the parents with the vocabulary terms, concepts and strategies taught in the training program and encouraging use within the natural environment, parents should receive training on how to use these resources in a more functional and consistent manner. Parents should be taught different ways to prompt their child to use the knowledge and materials gained from the training program during naturally occurring social situations, including when their child is engaging in both flexible and inflexible behaviours. Siblings and peers should be taught how to identify patterns of inflexible or negative interactions, and they should be taught responses and strategies to change such interactions. This may include sessions that focus on resiliency training. Fourth, maintenance and generalization should be continuously measured in multiple settings, through both direct observation and report measures completed by multiple informants.

Conclusions

Due to the range of social-cognitive deficits common in individuals with HFA and AS, as well as the detrimental outcomes that that have been found to be connected to the presence of social impairments, it is crucial to identify social interventions for these

individuals that are effective and evidence-based. Despite widespread use of the Social Thinking and Superflex curricula in clinical and school settings to address the social-cognitive challenges of individuals with HFA and AS, including challenges with flexible thinking, the effectiveness of this approach is unclear without sufficient well-conducted research. The aim of this study was to start exploring the Superflex curriculum within a research context, specifically with respect to teaching one individual with HFA how to think and behave flexibly in social situations.

As described above, the findings of this study were mixed. Overall, Steven's mother reported that her family's participation in this study was a positive experience, and she perceived improvements in Steven behaviour with respect to his flexibility in social situations, and his interactions with his sister. Steven and Sarah also reported that their experiences were generally positive, however they reported moderate to limited improvements in Steven's behaviour. Finally, the direct observation data collected in the non-training setting suggested that Steven made no improvements in his behaviour over the duration of this study.

As a pilot study for future research on the Social Thinking and Superflex curricula, the findings of this study are only preliminary. However, this study offers valuable information with regards to delivery of the lesson plans and supplementary resources. Further, this study highlighted the value of utilizing multiple measurement tools and data triangulation to analyze the impact of the training program, as opposed to relying on only one or two measures and drawing faulty conclusions from the data, as well as the need to incorporate strategies that promote maintenance and generalization in the natural environment. Most importantly, it is hoped that the measures and procedures

used, the findings, and the limitations and recommendations for future research uncovered in this study will have an impact on subsequent research studies examining the effectiveness of the Social Thinking and Superflex curricula in addressing the social-cognitive deficits present in individuals with HFA and AS.

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Appendix A
Demographics Questionnaire

BASIC DEMOGRAPHICS QUESTIONNAIRE

Dear parents. For research purposes we ask you to provide some information about your family. The reason we do this is so that we can describe the characteristics of our participants so that other researchers and clinicians can see for what kinds of children and families this intervention may be efficacious. We thank you for providing this information, which of course, will remain confidential.

Date: *(M-D-Y)*	**Filled out by:**

Childs Name: *(Last, First)*	☐ M ☐ F	**DOB:** *(M-D-Y)*

Ethnicity of Child:	☐ Caucasian ☐ Latino/Latina ☐ Asian/Pacific Islander ☐ African Canadian ☐ Multiracial Please specify: _____ ☐ Rather not say

PARENT / FAMILY INFORMATION

Marital Status of Primary Caregiver: ☐ Single ☐ Married or Common-law ☐ Separated or Divorced

Mother's DOB: *(M-D-Y)*	**Father's DOB:** *(M-D-Y)*
Current Occupation of Mother:	**Current Occupation of Father:**

Total Family Income Before Taxes:
☐ less than $5,000 ☐ $5,000-9,999 ☐ $10,000-14,999 ☐ $20,000-24,999 ☐ $25,000-29,999
☐ $30,000-34,999 ☐ $35,000-39,999 ☐ $40,000-44,999 ☐ $45,000-49,999 ☐ $50,000-54,999
☐ $55,000-59,999 ☐ $60,000-64,999 ☐ $65,000-69,000 ☐ $70,000-74,999 ☐ $75,000-79,999
☐ $80,000-84,999 ☐ $85,000-89,000 ☐ $90,000-94,999 ☐ more than $95,000

Education Level of Primary Caregivers: *(circle one that applies)*

Mother:	Less than high school	High school graduate	College graduate	University graduate
Father:	Less than high school	High school graduate	College graduate	University graduate
Other primary caregiver:	Less than high school	High school graduate	College graduate	University graduate

MEDICATIONS

Is your child on any medications? ☐ Yes ☐ No (If so, please list medication, reason and dosage)

Medication	Reason	Dosage

SUPPLEMENTS

Does your child take any vitamins or supplements? ☐ Yes ☐ No (If so, please list)

***Note:** You are asked to refrain from making changes to any medications that your child is receiving during the course of this study. Also, we ask that your child not participate in any other social treatment programs (e.g., social skills groups, intervention programs) during the course of this study. We ask this of you so that we can carefully evaluate the effects of our training program.

Appendix B

Acquisition Target Behaviours Observation Recording Sheet

Participant: _____ Observer: _____ Training session: _____ Date: _____

Target Code		Frequency Count 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	Total
Prompted Verbal	P.1																															
	P.2																															
	P.3																															
	P.4																															
	P.5																															
	P.6																															

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
Spontaneous Verbal	S.1																															
	S.2																															
	S.3																															
	S.4																															
	S.5																															
	S.6																															

Appendix C

Generalization Target Behaviours Observation Recording Sheet

Participant: _____ Observer: _____ Session date: _____

Baseline [ ] Play Probe [ ] Post-Training [ ] Follow-up [ ]

Target Code		Interval / Time 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	Total
Expected	E-V.1																															
	E-V.2																															
	E-V.3																															
	E-V.4																															
	E-NV.1																															
	E-NV.2																															

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
Unexpected	U-V.1																															
	U-V.2																															
	U-V.3																															
	U-V.4																															
	U-NV.1																															
	U-NV.2																															
	U-NV.3																															
	U-NV.4																															
	U-NV.5																															
	U-NV.6																															
	U-NV.7																															

Continue on next page...

Target		Interval / Time																													Total
Code		31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	
Expected	E-V.1																															
	E-V.2																															
	E-V.3																															
	E-V.4																															
	E-NV.1																															
	E-NV.2																															

Number of intervals with expected behaviour: _____ Percentage of intervals with expected behaviour: _____

		31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	
Unexpected	U-V.1																															
	U-V.2																															
	U-V.3																															
	U-V.4																															
	U-NV.1																															
	U-NV.2																															
	U-NV.3																															
	U-NV.4																															
	U-NV.5																															
	U-NV.6																															
	U-NV.7																															

Number of intervals with unexpected behaviour: _____ Percentage of intervals with unexpected behaviour: _____

Appendix D
Parent Report Forms

Date: _____

Please answer the following questions, taking into consideration all relevant situations over the past week.

1. Describe a situation in which your son was inflexible in his thinking and behaviour in a social interaction.

   Did your son use Superflex Strategies when dealing with the situation? If yes, describe.

   What did your son say about his thoughts and feelings about the incident when the situation was over?

   How well did your son handle the situation?

   Very Effectively ----- Effectively ----- Satisfactorily ----- Ineffectively ----- Very Ineffectively

2. Describe a situation in which your son was flexible in his thinking and behaviour in a social interaction.

Did your son use Superflex Strategies when dealing with the situation? If yes, describe.

What did your son say about his thoughts and feelings about the incident when the situation was over?

How well did your son handle the situation?

Very Effectively ----- Effectively ----- Satisfactorily ----- Ineffectively ----- Very Ineffectively

3. Does your son shift his behaviour to match the perspectives of others?

   Always ---------- Frequently ---------- Occasionally ---------- Seldom ---------- Never

4. Does your son behave flexibly while engaging in play activities with others?

   Always ---------- Frequently ---------- Occasionally ---------- Seldom ---------- Never

5. Does your son behave flexibly while engaging in conversations with others?

   Always ---------- Frequently ---------- Occasionally ---------- Seldom ---------- Never

6. Overall, is your son a flexible thinker?

   Always ---------- Frequently ---------- Occasionally ---------- Seldom ---------- Never

7. Overall, is your son rigid and stuck in his way of thinking?

   Always ---------- Frequently ---------- Occasionally ---------- Seldom ---------- Never

8. Overall, how effective is your son in thinking and behaving flexibly?

   Very Effectively ----- Effectively ----- Satisfactorily ----- Ineffectively ----- Very Ineffectively

Do you have any questions or concerns about the training program? Or other comments you want to make about your child's flexibility in thinking or behaving?

Significant Upsets and Inflexibility Recording Form

Behaviour Targets:

1. Insistence on following routines, rules, and/or his way of doing things
2. Inappropriate actions (rude comments, throwing/misusing play-related items, etc.)
3. Refusal / protesting (noncompliance, not listening, cannot be reasoned with, etc.)
4. Quitting or leaving the activity area, table, room, or threatening to leave

For each incident of significant upset or inflexibility this week, please indicate the situation (event/location), your child's behaviour (by checking off one or more of the behaviour targets), and any comments regarding the situation or his behaviour.

Situation	**Behaviour Targets**				**Comments:**
	1.	**2.**	**3.**	**4.**	

Thank you for taking time to fill this out ☺

Appendix E
Interview Questions

Pre-Training Interview Questions

Interview questions for the participant:

1. Describe a recent situation in which you were inflexible (upset, anxious, or had a meltdown) when engaging in a social interaction.
    a. How did you cope with the situation at the time?
    b. What did you say about your thoughts and/or feelings about the situation?
    c. How did the situation make you feel?
    d. What did the other person/your mother say or do about the situation?
    e. How could you have handled the situation differently?
2. Describe a recent situation in which you were flexible in a social situation.
    a. How did you cope with the situation at the time?
    b. What did you say about your thoughts and/or feelings about the situation?
    c. How did the situation make you feel?
    d. What did the other person say or do about the situation?
    e. What do you think you did that made it easier for you to be more flexible in this situation?
    f. What could you do in the future to be more flexible and have less upsets?
3. On a scale of 0-10, rate how flexible your son is on average, with 0 being completely not flexible and 10 being completely flexible.

Interview questions for the parent:

1. What would you describe as your child's strengths?
2. What kind of activities does your child enjoy or is your child good at?
3. What kind of activities does your child not enjoy or thinks he/she is not good at?

4. How does your child do academically? Are there certain subjects that are more challenging?

5. Describe the challenges your son experience in social interactions with peers.

6. Give examples of how your son has difficulty with any of the following:

    a. How does he show you that he understands your point of view?

    b. How does he change his behaviour to meet the expectations of others?

    c. How does he show that he can be flexible in conversations with others?

    d. How does he show that he can be flexible in peer interactions (e.g. when playing games and taking turns with others)?

    e. How does he do at following rules at home, school and in the community?

7. Describe a recent situation in which your son was inflexible (upset, anxious, or had a meltdown) when engaging in a social interaction.

    a. How did he cope with the situation at the time?

    b. What did he say about his thoughts and/or feelings about the situation?

    c. What did you say or do about the situation during or afterwards?

    d. How did the whole situation make you feel about him?

    e. How did it make you feel about yourself as a parent?

    f. How could he have handled the situation differently?

    g. What could you have done/said to make a difference?

8. Describe a recent situation in which your son was flexible in a social situation.

    a. How did he cope with the situation at the time?

    b. What did he say about his thoughts and/or feelings about the situation?

    c. What did you say or do about the situation during or afterwards?

    d. What do you think he did that made it easier for him to be more flexible in this situation?

9. On a scale of 0-10, rate how flexible your son is on average, with 0 being completely not flexible and 10 being completely flexible.

10. What would you like your son to get out of this training program?

Post-Training Interview Questions

Interview questions for the participant:

4. Describe a recent situation in which you were inflexible (upset, anxious, or had a meltdown) when engaging in a social interaction.
    a. How did you cope with the situation at the time?
    b. What did you say about your thoughts and/or feelings about the situation?
    c. What did the other person say or do about the situation?
    d. How could you have handled the situation differently?
    e. Overall, has your ability to handle such situations improved?
5. Describe a recent situation in which you were flexible in a social situation.
    a. How did you cope with the situation at the time?
    b. What did you say about your thoughts and/or feelings about the situation?
    c. What did the other person say or do about the situation?
    a. What could you do in the future to be more flexible and have less upsets?
    b. Overall, has your ability to handle such situations improved?
6. We are going to start working with other kids just like you. How would you describe Superflex and the Team of Unthinkables to other kids? What advice can you give the kids on how to defeat the Unthinkables?
7. Which Unthinkables did you make the most progress in defeating? How did you defeat those Unthinkables?
8. Did you find the vocabulary terms and strategies provided through the training program helpful when dealing with your inflexibility in social situations?
    a. How often did you use these vocabulary terms and strategies when dealing with situations at school? At home?
9. What did you like about the Superflex Academy and the time you spent at Brock? What did you not like?
10. Do you have any other comments about participating in this training program?

11. On a scale of 0-10, rate how flexible you are, with 0 being very inflexible and 10 being very flexible.

12. On a scale of 0-10, rate how effective you think this training program was in helping you be more flexible in your thinking and behaviour, with 0 being very ineffective and 10 being very effective.

Interview questions for the <u>parent</u>:

1. Over the past three months have you noticed a difference in your son's ability to:
    a. Show you that he understands your point of view or what you want?
    b. Change his behaviour to meet the expectations of others?
    c. Change his behaviour to match the context / environment?
    d. Show that he can be flexible in conversations with others?
    e. Show that he can be flexible in peer interactions (e.g. when playing games and taking turns with others)?
2. Describe a recent situation in which your son was inflexible (upset, anxious, or had a meltdown) when engaging in a social interaction.
    h. How did he cope with the situation at the time?
    i. What did he say about his thoughts and/or feelings about the situation?
    j. What did you say or do about the situation during or afterwards?
    k. How could he have handled the situation differently?
    l. What could you have done/said to make a difference?
    m. Overall, has his ability to handle such situations improved?
3. Describe a recent situation in which your son was flexible in a social situation.
    a. How did he cope with the situation at the time?
    b. What did he say about his thoughts and/or feelings about the situation?
    c. What did you say or do about the situation during or afterwards?

   d. What do you think he did that made it easier for him to be more flexible in this situation?

   c. Overall, has his ability to handle such situations improved?

4. Did you notice a change in your son's behaviour over the duration of the study?

   a. If so, please describe.

   b. If prompting needed:
      i. Describe 3 contexts where you have seen more flexibility in his behaviour.
      ii. How did he behave that would have been different 3 months ago?
      iii. Are there any contexts where he is still inflexible?

5. On a scale of 0-10, rate your son's ability to generate answers to the homework tasks given during the training program (including coming up with examples of his behaviour and thoughts).

   a. Rate the degree of prompting you provided your son while he was completing the homework tasks.

6. Did you find the vocabulary terms and strategies provided through the training program helpful when dealing with your son's inflexibility in social situations?

   a. How often did your son use these vocabulary terms and strategies when dealing with situations at school? At home?

   b. How often did you use these vocabulary terms and strategies when talking to your son or helping him dealing with situations?

7. What did you like about the training program? What did you not like?

8. Do you have any other comments about your family's participation in this training program?

9. On a scale of 0-10, rate how flexible your son is, with 0 being very inflexible and 10 being very flexible.

10. On a scale of 0-10, rate how effective you think this training program was in helping your son be more flexible in his thinking and behaviour, with 0 being very ineffective and 10 being very effective.

Interview questions for the sibling:

1. Describe a recent situation in which your brother was inflexible (upset, anxious, or had a meltdown) when engaging in a social interaction.
    a. How did he cope with the situation at the time?
    b. What did you he about his thoughts and/or feelings about the situation?
    c. What did you say or do about the situation?
    d. How could he have handled the situation differently?
    e. Overall, has his ability to handle such situations improved?
2. Describe a recent situation in which your brother was flexible in a social situation.
    a. How did he cope with the situation at the time?
    b. What did he say about his thoughts and/or feelings about the situation?
    c. What did you say or do about the situation?
    d. What could he do in the future to be more flexible and have less upsets?
    e. Overall, has his ability to handle such situations improved?
3. Did you enjoy playing games with your brother every weekend?
4. Did you notice a change in your brother's behaviour over the duration of the study? (probe while playing games every weekend)
5. What did you learn about how to be a Social Detective, and Superflex and Unthinkables, by being around your brother? (probe use of vocabulary terms and Superflex strategies)

Appendix F
Recruitment Flyer

Brock

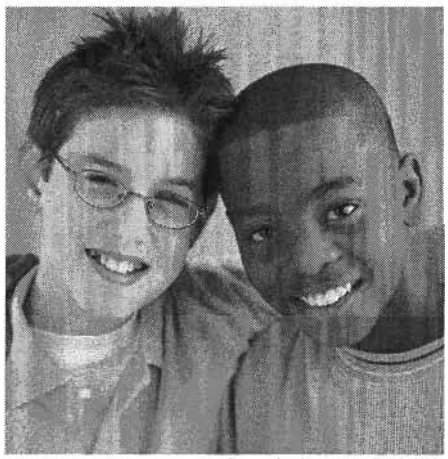
Detectives and Superheroes: Teaching Flexible Thinking to Children with High Functioning Autism and Asperger Syndrome

Researchers at Brock University are currently recruiting children between 8 and 10 years of age with a diagnosis of high functioning autism (HFA) or Asperger syndrome (AS) for a research study.

At least one parent must be willing to participate in the study with their son or daughter, and at least one familiar peer or sibling must be identified to participate in the study as well.

The purpose of the study is to evaluate the usefulness of a training program in teaching children with HFA and AS how to think and behave flexibly in social situations. The training program will involve selected lesson plans from *Superflex: A Superhero Social Thinking Curriculum* (Madrigal & Winner, 2008).

Children with HFA and AS often experience challenges with flexible thinking in social situations, and as a result they may have difficulty making friends. They may feel socially isolated or be bullied by peers. This can impede their quality of life, and lead to a number of detrimental long-term outcomes, including social challenges as an adult.



(Google Images, 2010)

Participation in the study will include a 10-week individual training program and opportunities to engage in fun activities with a familiar peer or a sibling.

Children will learn strategies to become more flexible thinkers, possibly leading to an increased ability to engage in social interactions with other children.

If you are interested in learning more about this study, please contact Dr. Rebecca Ward at 905-688-5550 ext. 5778, or email bward@brocku.ca

This study has been reviewed and has received ethics clearance through Brock University's Research Ethics Board (file # 10-203)

Appendix G

Participant Letter of Invitation

Dear parent,

This letter is to invite you and your child to participate in a research study, entitled "Detectives and Superheroes: A Pilot Study Teaching Flexible Thinking in Social Situations to a Child with High Functioning Autism."

The purpose of this research study is to evaluate the usefulness of a training program in teaching children with high functioning autism and Asperger syndrome how to think and behave flexibly in social situations. The training program will involve selected lessons from *Think Social!* (Winner, 2008) and *Superflex: A Superhero Social Thinking Curriculum* (Madrigal & Winner, 2008), which focus on helping children with social challenges develop a greater awareness of the inflexibility of their own thinking in social situations, and on providing these children with social cognitive strategies to help them modify their thoughts and actions. This research study will examine whether participation in the training program results in improvements in flexible thinking and observable changes in social behaviour within daily social interactions.

The expected duration of the research study is 14 weeks. If you and your child agree to participate, you and your child will be asked to complete the following pre-training assessments, which should take one to three sessions:

a. Parent questionnaire about your son or daughter's social functioning (15 minutes)
b. Cognitive assessment with your child (45 minutes).
c. Brief interview with you and your child (30 minutes each)
d. Two to five direct observation sessions of your son or daughter engaging in activities with a peer or a sibling to establish your child's level of flexibility in social interactions with peers (30 to 40 minutes each)

Following the pre-training assessments, your child will begin the training program, which will run for 10 weeks. Training sessions will be held every week at Brock University, and they will be 1.5 hours in length. At the end of each training session your child will be assigned a fun homework task to complete for the next training session. Each week you will be asked to help your child with the task, as well as to complete a parent report sheet.

After each training session your child will take part in an observation session with a peer or sibling within your home, to assess the impact of training on flexible thinking and behaviour. There will also be an observation session upon the competition of the training program, and a final observation one month after training to assess how well your child was able to continue using what they learned from training.

Upon completion of the training program, you and your child will be asked to complete post-training assessments, which will require one or two sessions. You will be asked to complete the same questionnaire completed at the start, and each of you will be asked to take part in another brief post-training interview. All of the interviews will be recorded using an

audiotape, and all of the observation sessions and training sessions will be videotaped. This will aid in the data collection and analysis procedures.

You will be asked to find a peer or sibling to participate in the home-based observation sessions with your child. Peers can include neighbors, classmates, family friends, or cousins. If you are interested in participating, more detail about this will be given at our first meeting.

Although we cannot promise that your child will benefit from participating in the study, it is likely that he or she will become more aware of how flexible thoughts can impact flexible actions, leading to more positive social interactions at home and at school. Your child will be taught strategies to help him or her think and act more flexibly, so that he or she is better able to deal with challenging social situations. As a result of participating in the study, it is likely that your child will engage in increased levels of appropriate and flexible behaviour and less inappropriate and inflexible behaviour. It is hoped that the study will aid your child in his or her ability to engage in social interactions. Furthermore, this research study should benefit the scientific community, as you and your child's participation will help identify whether the Superflex curriculum is an effective tool in teaching children with high functioning autism and Asperger syndrome important social skills. As such, it is possible that you and your child's participation will benefit other children with high functioning autism and Asperger syndrome.

We are happy to give you more information and answer any of your questions about the study to help you both decide whether or not to participate in the study.

If you have any questions about your rights as a research participant, please contact the Brock University Research Ethics Office (905-688-5550 ext. 3035, reb@brocku.ca).

If you have any questions, or you have decided that you and your son/daughter would like to participate in the study, please contact Dr. Rebecca Ward (905-688-5550 ext. 5778, bward@brocku.ca).

Thank you for your interest in this study.

Sincerely,

Dr. Rebecca Ward
Principle Investigator
Assistant Professor
Centre for Applied Disability Studies
Brock University
bward@brocku.ca
905-688-5000 ext. 5778

Kelly Baker
Principle Student Investigator
Master of Arts Student
Centre for Applied Disability Studies
Brock University
kb09mo@brocku.ca

This study has been reviewed and received ethics clearance through Brock University's Research Ethics Board (file # 10-203).

Appendix H

Peer / Sibling Participant Letter of Invitation

Dear parent,

This letter is to invite your child to participate in a research study to help children with high functioning autism or Asperger syndrome to think and act flexibly. The person who gave you this invitation is the parent of a child with high functioning autism or Asperger syndrome; he/she is inviting your child to be a peer/sibling participant in a study to help their child learn about flexible thinking.

The purpose of this research study is to evaluate the usefulness of a training program in teaching children with high functioning autism and Asperger syndrome how to think flexibly in social situations. This research study will examine whether participation in the training program results in improvements in flexible thinking and observable changes in social behaviour within daily social interactions.

The expected duration of the research study is 14 weeks. If you and your child agree to participate, your child will be asked to take part in 13 to 15 observation sessions within the primary participant's home. Each session will be 30 to 40 minutes in length. Within the sessions your child will engage in fun activities (for example, games, construction play, crafts, snacks, etc.) with the primary participant and the research investigators. Furthermore, your child will be asked to take part in a follow-up observation session one month following the original 14 weeks of observations. All of the observation sessions will be videotaped. This will aid in the data collection procedures.

Your child should benefit from participating in the study, as he or she will have the opportunity to take part in fun activities with a peer. Your child's participation will also benefit the primary participant, as he or she is learning how to better engage in social interactions with peers. Furthermore, this research study should benefit the scientific community, as your child's participation will help identify whether the training program under investigation is an effective tool in teaching children with high functioning autism and Asperger syndrome important social skills.

If you have any pertinent questions about your rights as a research participant, please contact the Brock University Research Ethics Office (905-688-5550 ext. 3035, reb@brocku.ca).

If you have any questions, please feel free to contact Dr. Rebecca Ward (905-688-5550 ext. 5778, bward@brocku.ca).

Thank you for your interest and involvement in this study.

Sincerely,

Dr. Rebecca Ward
Principle Investigator
Assistant Professor
Centre for Applied Disability Studies
Brock University
bward@brocku.ca
905-688-5000 ext. 5778

Kelly Baker
Principle Student Investigator
Master of Arts Student
Centre for Applied Disability Studies
Brock University
kb09mo@brocku.ca

This study has been reviewed and received ethics clearance through Brock University's Research Ethics Board (file # 10-203).

Appendix I

Participant Assent Form

Assent Script:

To be read to potential participants. Note: the script may be adjusted to ensure comprehension depending on the individual needs of the child.

My name is Rebecca Ward/Kelly Baker. I am a researcher from Brock University. I am asking if you would like to be a part of a research study called "Detectives and Superheroes: A Pilot Study Teaching Flexible Thinking in Social Situations to a Child with High Functioning Autism." The study is about teaching children how to be more aware of their thinking and behaviour in social situations, and how to become a flexible thinker.

If you agree to be in this study, I will talk to you and your parents about how often you are a flexible thinker and the strategies that you use when you are faced with social challenges. I am also going to plan fun activities for you to do with a familiar peer or a brother or sister, like playing board games. We are going to do this 13 to 15 times over the next three to four months.

You are also going to come to Brock University every week to learn more about how to think flexibly. In these sessions we are going to talk about a superhero named Superflex, and the Team of Unthinkables that challenge Superflex. I am going to teach you different Superflexible Strategies to help Superflex defeat the Unthinkables. You can also use these strategies outside of the sessions, when you are faced with social challenges. After each session, you are going to get a fun homework task to do during the week and bring back the next week.

If you agree to be in this study, I am going to videotape you while you play with the peer and while you are at Brock University learning about Superflex. Even though you will be videotaped, any information you give me and anything that happens during the study will be kept private.

While participating in this study, there are times that you might feel upset, anxious or frustrated. If this happens, you can talk to your parents or me about it, and you can ask to take a break or stop at any time. By being a part of this study, you will learn ways to change your thoughts and behaviour so that you are able to deal with difficult social situations, and hopefully you will not feel upset, anxious or frustrated anymore.

This study is voluntary. That means that you decide whether or not to take part in the study. I have asked your parents to give their permission for you to be a part of this study, but even if your parents say "yes," you can still decide to not take part in this study. Being in this study is up to you, and no one will be upset if you do not want to participate. If you decide to be in this study now, but change your mind later, that is okay too. You can stop being a part of this study at any time.

You can ask questions about this study any time, now or later.

Do you have any questions now?

Participant Assent:

Verbal assent given: [ ] Yes [ ] No

I want to participate in this study. I know that I can change my mind at any time. By signing my name I agree to be in this study.

Participant's Name:_____ Signature:_____ Date:_____

I confirm that I have explained the study to the participant to the extent compatible with the participants understanding, and that the participant has agreed to be in the study.

Investigator's Name:_____ Signature:_____ Date:_____

Appendix J

Participant Alternative Informed Consent Form

Title of Study: Detectives and Superheroes: A Pilot Study Teaching Flexible Thinking in Social Situations to a Child with High Functioning Autism

Dr. Rebecca Ward
Assistant Professor
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Kelly Baker
Master of Arts Student
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Information about the Study

You and your child have been invited to participate in a study that involves research. The purpose of this study is to evaluate the usefulness of a training program in teaching children with high functioning autism and Asperger syndrome how to think flexibly in social situations. This research study will examine whether participation in the training program results in improvements in flexible thinking and observable changes in social behaviour within daily social interactions.

Participation will take approximately 14 weeks of your time. As a participant, you and your child will be asked to complete pre-training assessments. You will be asked to complete a questionnaire and an interview. Your child will be asked to complete a psycho-educational evaluation and an interview, and take part in a number of observation sessions in your home while interacting with a familiar peer or sibling. Following the pre-training assessments, your child will begin a 10-week training program at Brock University. After each training session your child will take part in an observation session in your home, while interacting with a peer or sibling. Furthermore, during the training, your child will be assigned fun weekly homework tasks, and you will be asked to help your child with the tasks and support your child in using the strategies acquired in the training within natural contexts. You will also be asked to complete a parent report sheet each week. Following the training program, you will be asked to compete post-training assessments, including a questionnaire and an interview. Your child will be asked to take part in an interview and an additional observation session. The interviews will be recorded using an audiotape and transcribed verbatim. The investigators will facilitate all of the observation sessions and training sessions, and the sessions will be videotaped to aid with data collection. One month following the completion of the 14 weeks of the study, your child will be asked to complete a follow-up observation session, conducted in the same manner as the previous observation sessions.

In order to participate in this research study, it is required that you identify one or two familiar peers or siblings that could potentially be involved in the observation sessions with your son or daughter, and that your give the peers' parents the Peer Letter of Invitation.

Potential Benefits and Risks

Possible benefits of participation for your child include becoming more aware of his or her own thoughts and behaviours. Your child will be taught strategies to help him or her think and act more flexibly, so that he or she is better able to deal with challenging social

situations. As a result of participating in the study, it is likely that your child will engage in increased levels of appropriate and flexible behaviour in naturally occurring social contexts, and less inappropriate and inflexible behaviour. It is hoped that the study will aid your child in his or her ability to engage in social interactions. It is possible that the study will benefit you as the parent, as the training program will provide you with vocabulary terms and strategies to help you engage in meaningful interactions with your son or daughter, which may strengthen your relationship with your child.

Furthermore, this research study should benefit the scientific community, as you and your child's participation will help identify whether the Superflex curriculum is an effective tool in teaching children with high functioning autism and Asperger syndrome important social skills. As such, it is possible that you and your child's participation will benefit other children with high functioning autism and Asperger syndrome.

Possible risks of participation for your child include experiences of anxiety and stress. Your child will be asked to talk about topics with which they may have experienced challenges; and within the observations sessions your child will be asked to interact with a peer or sibling, and depending on the nature of these interactions, this may initially make your child uncomfortable. These risks are not greater than what might be expected in your child's normal interactions with a sibling or with peers at school. Every effort will be taken to ensure sessions are fun, engaging, and non-stressful. To manage the possible risks of participating in the study, the investigators will approach sensitive discussion topics using the curriculum concepts and vocabulary terms in a manner that normalizes the experience. If your child becomes too upset or stressed because of the sensitivity of the topic or because of getting upset over an activity, the investigators and your child will work through the problem, demonstrating how the curriculum concepts, vocabulary and cognitive strategies are helpful in teaching ways to calmly deal with social problems. If for any reason your child continues to be upset for more than 15 minutes, or if he or she asks to terminate the session at any time, the session will be terminated and re-scheduled. If three sessions need to be terminated due to anxiety, stress, etc, the principle investigator will speak with you and re-assess whether your child should continue to be involved in the study.

Confidentiality and Anonymity

All information collected for this study will be kept confidential. However, in rare cases, it may not be possible to ensure confidentiality because of mandatory reporting laws (e.g. suspected child abuse or neglect) or the possibility of third party access to data (for example, court subpoena of records).

You and your child's name, and any personal identifiers, will not appear in any reports resulting from this study. All data, including data containing personal identifiers, will be stored in a locked filing cabinet in the office of the principle investigator, at Brock University, and only the research investigators will be able to access this information. The data obtained in the interview and videotape assessments will not be anonymous to the investigators, due to the audio and video recordings, but no personal identifiers will be included in the reporting of the results. However, with your permission, anonymous quotations from the interviews may be used. Shortly after the interviews have been completed, you will be sent a copy of the transcript to give you an opportunity to confirm the accuracy of the interview, and to add or clarify any points. Data will be kept for up to five

years, after which time all data will be destroyed. All hard-copy documents will be shredded, and the audiotapes and videotapes will be erased.

Voluntary Participation

Participation in this study is voluntary. You or your child may decline to answer any questions or to participate in any component of the study. Further, you or your child may decide to withdraw from this study at any time and may do so without any penalty.

Publication of Results

Results of this study will be included in the thesis to be written by the principle student investigator. Furthermore, the results may be published in professional journals and be presented at conferences. Feedback about this study will be provided to you in a debriefing session and letter following the one-month follow-up assessment. You may also contact the investigators should you want additional feedback.

Contact Information and Ethics Clearance

If you have any questions about this study or require further information, please contact the principle investigator or the principle student investigator using the contact information provided above.

This study has been reviewed and received ethics clearance through the Research Ethics Board at Brock University (file # 10-203). If you have any comments or concerns about you or your child's rights as a research participant, please contact the Research Ethics Office at 905-688-5550 ext. 3035, reb@brocku.ca

Thank you for your assistance in this project. Please keep a copy of this form for your records.

Statement of Permission

I agree:	YES	NO
-to allowing my child to take part in all of the assessments described above		
-to allowing my child to participate in weekly observation sessions with a peer or sibling, which will involve allowing the investigators and peer or sibling to come into my home and engage in activities		
-to allowing my child to participate in weekly training sessions at Bock University		
-to allowing the investigators to audio record my child during the interviews, to transcribe the interviews verbatim, and to use anonymous quotations from the interviews when reporting the results		
-to allowing the investigators to video record my child during all sessions		

By signing below I provide permission for my child, _____, to participate in the study described above, should he or she choose to participate.

Parent's Name:_____ Signature:_____ Date:_____

Informed Consent

I agree:	YES	NO
-to identifying and approaching potential peers/siblings to participate in the study with my child		
-to taking part in all of the assessments described above		
-to allowing the investigators to audio record my interviews, to transcribe the interviews verbatim, and to use anonymous quotations from the interviews when reporting the results		
-to participating in the last 15 minutes of each training session with my child and the investigators		

By signing below I agree to participate in the study described above. I have made this decision based on the information I have read in the Letter of Invitation and this consent form. I have had the opportunity to receive any additional details that I wanted about the study, and I understand that I may ask questions in the future. I understand that I may withdraw this consent at any time.

Parent's Name:_____ Signature:_____ Date:_____

I confirm that I have explained the study to the parent to the extent compatible with the parent's understanding, and that the parent has agreed to be in the study.

Investigator's Name:_____ Signature:_____ Date:_____

Appendix K

Participant Consent Questions

To ensure understanding, the participant will be asked the following questions: (expected answers are in brackets)

1. Do you have to participate in this study? (No)

2. If you do not want to participate, what will happen to you? (Nothing)

3. If you agree to participate and then decide you do not want to after you have started the training program, are you allowed to drop out and stop being a participant? (Yes)

4. If you agree to participate and then decide at the end of the study that you do not want your data to be used, are you allowed to drop out and stop being a participant? (Yes)

If the participant has trouble answering the above questions, the information will be explained again using simpler language, and the questions will be asked until the participant demonstrates full understanding (i.e. he answers all questions appropriately).

Appendix L
Sibling Participant Assent Form

Assent Script:
To be read to potential peer/sibling participants. Note: the script may be adjusted to ensure comprehension depending on the individual needs of the child.

My name is Rebecca Ward/Kelly Baker. I am a researcher from Brock University. I am asking if you would like to be a part of a research study called "Detectives and Superheroes: A Pilot Study Teaching Flexible Thinking in Social Situations to a Child with High Functioning Autism." The study is about teaching children how to be more aware of their thinking and behaviour in social situations, and how to become a flexible thinker.

If you agree to be in this study, you will be a sibling participant. I am going to plan fun activities for you to do with [insert participant's name], like playing board games. We are going to do this 13 to 15 times over the next three to four months.

If you agree to be in this study, I am going to videotape you while you play with [insert participant's name]. Even though you will be videotaped, any information you give me and anything that happens during the study will be kept private.

This study is voluntary. That means that you decide whether or not to take part in the study. I have asked your parents to give their permission for you to be a part of this study, but even if your parents say "yes," you can still decide to *not* take part in this study. Being in this study is up to you, and no one will be upset if you do not want to participate. If you decide to be in this study now, but change your mind later, that is okay too. You can stop being a part of this study at any time.

You can ask questions about this study any time, now or later.

Do you have any questions now?

Sibling Participant Assent:

Verbal assent given: [ ] Yes [ ] No

I want to participate in this study. I know that I can change my mind at any time. By signing my name I agree to be in this study.

Participant's Name:_____ Signature:_____ Date:_____

I confirm that I have explained the study to the sibling participant to the extent compatible with the participants understanding, and that the participant has agreed to be in the study.

Investigator's Name:_____ Signature:_____ Date:_____

Appendix M

Sibling Participant Alternative Informed Consent Form

Title of Study: Detectives and Superheroes: A Pilot Study Teaching Flexible Thinking in Social Situations to a Child with High Functioning Autism

Dr. Rebecca Ward
Assistant Professor
Centre for Applied Disability Studies
Brock University
bward@brocku.ca
905-688-5000 ext. 5778

Kelly Baker
Master of Arts Student
Centre for Applied Disability Studies
Brock University
kb09mo@brocku.ca

Information about the Study

Your child has been invited to participate in a study that involves research. The purpose of this study is to evaluate the usefulness of a training program in teaching children with high functioning autism and Asperger syndrome how to think flexibly in social situations. This research study will examine whether participation in the training program results in improvements in flexible thinking and observable changes in social behaviour within daily social interactions.

Participation will take approximately 14 weeks of your child's time. As a sibling participant, your child will be asked to take part in 13 to 15 observation sessions with the primary participant. Each session will be 30 to 40 minutes in length. Within the sessions your child will engage in fun activities (for example, games, crafts, snacks, etc.) with the primary participant and the research investigators. Furthermore, your child will be asked to take part in a follow-up observation session one month following the original 14 weeks of observations. The observation sessions will be videotaped to aid in data collection.

Potential Benefits and Risks

Possible benefits of participation for your child include increased opportunities to take part in fun activities with their sibling. Your child's participation will also benefit the primary participant, as he or she is learning how to better engage in social interactions with peers.

This research study should benefit the scientific community, as your child's participation will help identify whether the training program under investigation is an effective tool in teaching children with high functioning autism and Asperger syndrome important social skills.

There are no known or anticipated risks associated with your child's participation in this study. The primary participant will have a history of challenges in social situations, and it is possible that he or she will initially feel uncomfortable in the observation sessions. However, your child is familiar to the primary participant, and every effort will be taken by the investigators to ensure that the sessions are fun, engaging and non-stressful, thereby reducing the risk of the primary participant getting upset or frustrated during the sessions.

Confidentiality and Anonymity

All information collected for this study will be kept confidential. However, in rare cases, it may not be possible to ensure confidentiality because of mandatory reporting laws (e.g.

suspected child abuse or neglect) or the possibility of third party access to data (for example, court subpoena of records).

Your child's name and any personal identifiers will not appear in any reports resulting from this study. All data, including data containing personal identifiers, will be stored in a locked filing cabinet in the office of the principle investigator, at Brock University, and only the research investigators will be able to access this information. The data obtained involving your child will not be anonymous to the investigators, due to the video recordings, but no personal identifiers will be included in the reporting of the results. Data will be kept for five years, after which time all data will be destroyed. All hard-copy documents will be shredded, and the observation session videotapes will be erased.

Voluntary Participation

Participation in this study is voluntary. Your child may decline to answer any questions or to participate in any component of the study. Further, you or your child may decide to withdraw from this study at any time and may do so without any penalty.

Publication of Results

Results of this study will be included in the thesis to be written by the principle student investigator. Furthermore, the results may be published in professional journals and be presented at conferences. Feedback on your child's participation or the results of the study can be obtained by contacting the investigators using the contact information provided above.

Contact Information and Ethics Clearance

If you have any questions about this study or require further information, please contact the principle investigator or the principle student investigator using the contact information provided above.

This study has been reviewed and received ethics clearance through the Research Ethics Board at Brock University (file # 10-203). If you have any comments or concerns about you or your child's rights as a research participant, please contact the Research Ethics Office at 905-688-5550 ext. 3035, reb@brocku.ca

Thank you for your assistance in this project. Please keep a copy of this form for your records.

Statement of Permission

I agree:	YES	NO
-to allowing my child to participate in observation sessions with the primary participant, which will involve allowing my child to engage in activities with the primary participant and the research investigators		
-to allowing the investigators to video record my child during all sessions		

By signing below I provide permission for my child, _____, to participate in the study described above, should he or she choose to participate. I have made this decision based on the information I have read in the Letter of Invitation and this consent form. I have had the opportunity to receive any additional details that I wanted about the study, and I understand that I may ask questions in the future. I understand that I may withdraw this consent at any time.

Parent's Name:_____ Signature:_____ Date:_____

I confirm that I have explained the study to the parent to the extent compatible with the parent's understanding, and that the parent has agreed to allow his or her child to be in the study.

Investigator's Name:_____ Signature:_____ Date:_____

Appendix N
Training Program Schedule

Phase	Session	Topic Covered / Selected Lesson(s)
1	1	Introduction to the training program
		Being a Social Detective - Lesson: Expected and Unexpected Behaviour in a Group - Read *You are a Social Detective* (pg. 1-31)
	2	Being a Social Detective (cont.) - Lesson: Is Your Body in the Group or Out of the Group? - Lesson: Is Your Brain in the Group or Out of the Group? - Lesson: Thinking with our Eyes - Read *You are a Social Detective* (pg. 32-49) - Lesson: Social Detective
2	3	Introduction to Superflex and the Superflex Academy
		Superflex! - Lesson: The Training Begins! How Superflex Came To Be - Read *Superflex Takes on Rock Brain and the Team of Unthinkables*
	4	Superflex and Rock Brain - Lesson: Superflexible Thinking vs. Rock Brain Thinking - Lesson: Superflexible and Rock Brain Moments!
	5	Superflex and Glassman - Lesson: Superflex and Glassman - Read *Superflex Takes on Glassman and the Team of Unthinkables*
	6	Superflex and D.O.F. Destroyer of Fun - Lesson: Honorable Mention… D.O.F. Destroyer of Fun
	7	Superflex and the Team of Unthinkables - Lesson: In Comes the Team of Unthinkables
3	8	Introduction to behavioural contingency plan
		Superflex, the Ultimate Superhero! - Lesson: Levels to Becoming the Ultimate Superhero - Lesson: Practice… Practice… Practice
	9	Superflex, the Ultimate Superhero! (cont.) - Lesson: Creating our own Superflex Story! Superflex Takes on… - Lesson: Practice… Practice… Practice
	10	Superflex, the Ultimate Superhero! (cont.) - Lesson: Creating our own Superflex Story! Superflex Takes on… - Lesson: Practice… Practice… Practice

Appendix O

Handout – Social Thinking Vocabulary Terms

Vocabulary Term	**Definition**
Social smarts	The ability to read the hidden social rules in each context and the emotions and thoughts of others in order to regulate your physical presence, eyes, language, emotions, reactions, etc.
School smarts	Different types of "smarts" in your brain that is used for school learning; includes things like math smarts, computer smarts, music smarts, science smarts, and many more.
Doing what is "expected"	Things that you do and say that give people good thoughts about you and make them feel good; doing what is expected is different based on where you are and who you are with.
Doing what is "unexpected"	Things that you do and say that give people uncomfortable thoughts about you and make them feel mad or bad.
Good (okay, normal) thoughts	Others have thoughts about you based on what you do and say. When a person has a good thought about you, it means that you figured out how to act with that person.
Uncomfortable (weird) thoughts	When a person has an uncomfortable thought about you, it means that you did some behaviour that made the person take notice of you in a more negative way, just like when you take notice of other's behaviour that makes you have uncomfortable thoughts about them.
Whole body listening	Your whole body (eyes, ears, mouth, hands, feet, bottom, and brain) needs to be focused on the group in order to listen and to show you are listening.
Keeping your body and brain in the group	Understanding that your body needs to look interested and connected to the group and your brain needs to keep thinking about what the group is thinking in order to participate in the group. People can see when your body or brain does not appear to be a part of the group.
Your body rolled out of the group	When your body is turned or physically moved away from the group, and the others notice that you are not working as part of the group.
Your brain rolled out of the group	When your brain is distracted from what the group is doing and the other people in the group notice that you do not appear to be working as part of the group, even if your body is in the group.

Thinking about others	Considering what others are thinking and feeling in order to monitor and modify your behaviour to keep people feeling good about you.
Thinking with your eyes	Using your eyes to figure out what nonverbal messages others are sending.
Social detective	You are a good social detective when you use your eyes, ears and brains (your social detective tools) to figure out what others are planning to do next or are presently doing, and what they mean by what they say and do.
Figuring out other people's plans	Determining what people are planning to do next based on their physical actions or by interpreting their movement or eye direction. One must also figure out the subtle meaning within spoken language (this is a higher-level skill).
Making a "smart guess"	Using information you already know or have been taught to figure things out; smart guesses are expected and make others have good thoughts about you because they know you are trying to figure things out.
Making a "wacky guess"	Making a random guess without having any information to help you figure out what the guess should be; wacky guesses are unexpected and make others have uncomfortable thoughts.
Flexible thinking (Superflexible thinking)	The mental flexibility of your brain to interpret verbal and nonverbal information based on different points of view or different contexts. This is the opposite of having a Rigid Brain (Rock Brain).
Rigid Brain (Rock Brain)	When you follow a rule all the time or cannot interpret subtle different meanings in language or expression.
Tiny problem vs. big (earthquake) problem	Understanding that problems differ in severity, which then assists in helping you react appropriately to personal situations.

(Adapted from Madrigal & Winner, 2008; Winner & Crooke, 2008)

Appendix P

Social Detective Homework Report

You are a Social Detective: Homework Report

List 3 examples of <u>expected behaviours</u> that you did this week:

1. _____

2. _____

3. _____

Pick 1 example and draw a picture of what you did:

How did this behaviour make other people think about you?

_____

List 3 examples of <u>unexpected behaviours</u> that you did this week:

1. _____

2. _____

3. _____

Pick 1 example and draw a picture of what you did:

How did this behaviour make other people think about you?

_____

Appendix Q

Handouts – Parent Letter and Superflex Chart

Superflex® Our Social-Thinking Superhero!

Dear parents,

Your child is going to be learning about social thinking through the use of a fun new curriculum using a social-thinking superhero named Superflex! This curriculum is used with elementary and younger middle school students.

The goal of this curriculum is to provide a fun, motivating way to improve your child's social and behavioral flexibility and to ultimately develop better self-monitoring and self-feedback loops for his or her social behavior. The concept is based on the ideas that we all have a superhero, Superflex, in our brains, and he is constantly battling the Team of Unthinkables© (a variety of unexpected behaviors), such as: Rock Brain©, Un-Wonderer©, Brain Eater©, etc. who may come and try to take over our brains.

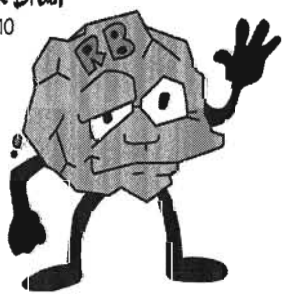
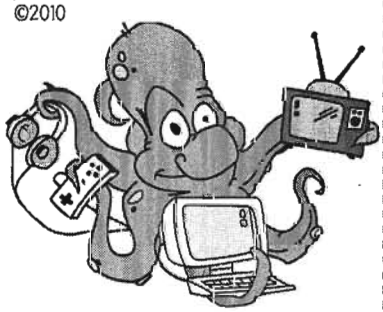
The lessons will provide several opportunities for your child to learn about various Unthinkable characters while building on his or her ability to recognize these behaviors in themselves and others. Your child will be able to identify what members are on his or her Team of Unthinkables and learn Superflexible Strategies to modify his or her behaviour to defeat the Unthinkables when they challenge Superflex.

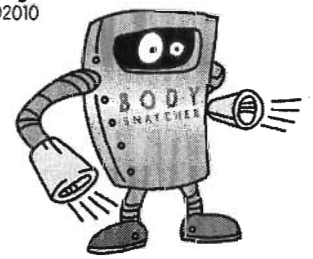
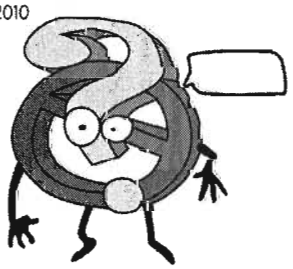
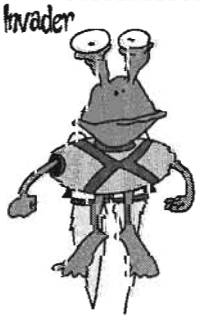
It will be important for you as parents to carry over the concepts and strategies that your child will learn in the sessions to assist with generalizing these skills. Each lesson will have an accompanying homework assignment to be completed and returned the following week. Please take the time to complete the homework and promote situations throughout the week that help foster the concepts learned in the sessions. The vocabulary and concepts used in this curriculum should provide you with additional positive opportunities to reinforce the skills learned by your child. Remember to keep the learning fun and positive! Really try to find those times where your child is being Superflex and using his or her strategies to think about others. This will help your child recognize the expected behaviors and make him or her feel good and motivated to continue using the strategies. This can be done with positive reinforcement such as social praise.

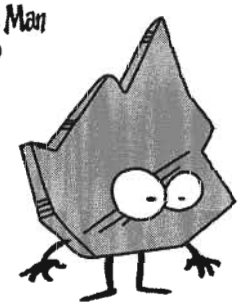
Here are some examples of how to reinforce these new concepts at home with your child:

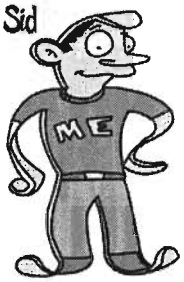
- "I liked that you defeated Rock Brain by using your Superflex Strategy. That made me feel proud. How do you feel?"
- "You really worked hard at keeping those hurtful thoughts in your head; nice job, Superflex!"
- "Okay, a Superflexible moment is coming up. Let's see if you can defeat Rock Brain and shut your video game off. Way to go Superflex!"
- "Hey Sam, you did a great job defeating Rock Brain today when you let Jimmy go first."
- "Tom, nice job defeating the Body Snatcher© while we were walking together in the store. I felt like you were really thinking about me."
- It may also be fun to identify when we notice Unthinkables taking over the brains of others. If you notice a situation, you can talk about it after the fact. For example, "did you notice when Brain Eater distracted dad's brain at dinner?"
- At dinnertime, you could "plant" an Unthinkable and see if your son or daughter notices. You could then help your child come up with a strategy to defeat the Unthinkable.

Super Hero	Superflex's strengths
Superflex® 	Our hero! Totally flexible, trying to figure out people's wants and needs to keep other people calm while also getting his turn to play and to speak as well. Superflex is a great problem- solver and can think of many different solutions to one problem.

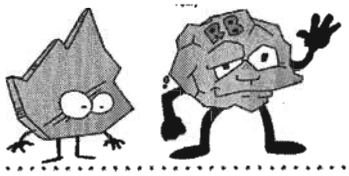
Team of Unthinkables	The "powers" they have over our brains	Superflex strategies to solve the problem and defeat the Unthinkable
Rock Brain ©2010 	He will get the person to do only what he wants to do and will not let him negotiate with other people. The person is not a good problem-solver and tries one solution that's not working over and over again. This person may be very rule bound and rigid in his thinking, only seeing one way to a situation.	Notice that what you are doing is not working and try another way to solve the same problem. Take a deep breath and remember that being part of a group means that you cannot always do it your way or make the decisions you want. Self talk: "Not a problem, I will get to do this later or another time..." Ask yourself, "What is their plan?" And then try to match their plan.
Brain Eater ©2010 	He makes it hard for the person to focus on what he is doing or focus on others during interactions (roll his brain away). The person may get easily distracted with his own thoughts or things around him.	Turn your body and eyes away from what is distracting you and think about the person talking. Use a fidget so that it keeps your body busy but your brain focused on the group. Try to notice when your brain is thinking about something else and get it to refocus on the group.

Team of Unthinkables	The "powers" they have over our brains	Superflex strategies to solve the problem and defeat the Unthinkable
Body Snatcher ©2010 	He gets the person to wander away from others (roll his body away) and not stay with the group or person he is with. May also get the person to turn his body away from the group, not realizing the message he is sending to others.	Use your eyes to think about where your group is or who is talking to you, and find the group! Self-talk: "Where should my body be?" Point your shoulders to the group.
D.O.F. The Destroyer of Fun ©2010 	This character often pops up during games or activities involving competition. The person becomes overly competitive and insists on going first, playing only what he wants to play, and does not think about compromising or about how he makes others feel.	Self-talk: " If I am a "Just Me" player, then my friends will not have a good time." Self-Talk: "Tiny problem. I will still get a turn or may win another time."
Un-Wonderer ©2010 	He stops the person from showing interest (social wondering) in others or thinking about what others may want to do. The person may not ask a lot of questions about others or add his ideas to what they are playing.	Look at the person who is talking to let him know that you are thinking about him and what he is saying. Listen to the topic and then ask a "social wonder" question of your friend. Create a friend-file in your brain to call on later to ask questions. Remember the Wh-question words and use them to think of questions for your friends.
Space Invader ©2010 	This character makes the person's body move into other people's personal space when others are not expecting it or do not want this. He does not realize how uncomfortable this makes others feel.	Use one-arm rule to determine if you are standing too close to someone. Think about what your body looks like in the group. Are you making others have good thoughts or weird thoughts? If you are making others have weird thoughts, adjust your body.

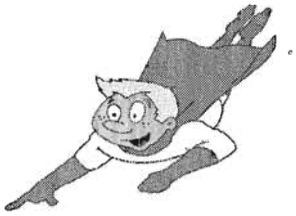
Team of Unthinkables	The "powers" they have over our brains	Superflex strategies to solve the problem and defeat the Unthinkable
Glass Man ©2010 	Lets a person be flexible to some extent, but then all of a sudden he just breaks. He doesn't melt down slowly; he quickly starts getting very upset often over "tiny" problems . Glass Man usually thinks things aren't "fair."	Identify the size of the problem (1-10) and what would be an expected reaction to match the size of the problem. Self-Talk: "I am starting to get mad. I need to move away and take a break or tighten all of the muscles in my body and then relax them.
Grump-Grumpaning ©2010 	Makes the person think the worst or feel like people are always unkind. He ends up believing it even when people are trying to be nice. He may also see everything as negative or bad and does not see how his emotion spreads and makes everyone feel unhappy.	Think about how the person treats you. Is he friendly or mean to you? If this person is friendly to me then he is not being mean to me. Self talk: "I am being negative. What could be a positive way to think about it?"
Topic Twister Meister ©2010 	This character gets the person to twist the topic around to what he wants to talk about and goes off on tangents when talking to others. This person may then go on and on about topics he wants to talk about, not realizing that others may be bored or disinterested in what he is talking about.	Check-in with those around you. Does it look like they are interested in what you are saying? If not, ask a question about what they might want to talk about. Turn off your "Me" button and try to think only about the other person by asking him questions.
Wasformyonce ©2010 	This person will attempt to use a lot of humor to be funny. However, he does not realize that humor wears out pretty quickly or at times is not "funny" at all. He has trouble recognizing appropriate times for humor and may try to be funny during a discussion in a classroom or when the moment is serious and not funny or silly. Some people may get so silly, that the other children become silly also, making the group fall apart. This is called getting caught up in the "silly tornado."	Self-talk: "Is now a silly moment or a serious moment?" If a serious moment, then this is not a good time to crack a joke or say something that I think is funny. Use the one-time-rule: only say the word or joke once and then move on so that the joke does not get boring for others.

Team of Unthinkables	The "powers" they have over our brains	Superflex strategies to solve the problem and defeat the Unthinkable
Energy Hare-y ©2010 	This character gives the person so much energy so that he is constantly fidgeting or moving around, and he doesn't think about what the people around him needs or how others are feeling around them. Sometimes, Energy Hare-y and Wasfunnyonce work together, which can quickly make the group fall apart.	When others are talking, use Whole Body Listening (keep your whole body quiet). Check-in with your eyes and see how the rest of the group is acting. Try to match how calm the other kids are with their bodies. Take a few deep breaths to calm your body.
One-Sided Sid ©2010 	This character gets the person to talk about his own set of topics or his own plan. Even when someone else brings up his interests, he just talks about his interests. He may interrupt to talk about what is on his mind, not seeing that someone may have another plan.	Open your friend-file and think about what you know about the person. Ask questions to find out more about him and his experiences or interests. Think with your eyes to figure out what the person's plan is. If he looks busy, save your question for another time. Look for clues that others are not interested: looking away, bored look, trying to change the topic.
Worry Wall ©2010 	He makes the person worry or feel nervous so much about the people around him or the social situations that he or she "hits a wall" and stops being able to talk at all to the people nearby.	Close your eyes, take a deep breath, and let it out slowly. Continue to do this until your body feels relaxed. Find a thought that can change how you are feeling. "Johnny is nice; he will help me with this."
Mean Jean ©2010 	This person becomes just plain mean to other people. He or she insults or criticizes others. He or she may take things away from them, be very bossy, or hog all the attention when others are trying to talk.	Think about what you are going to say before you say it. Self-talk: "Will this hurt my friend's feelings?" Keep bragging, bossy, or hurtful thoughts in our brains.

Appendix R
Superflex Homework Report

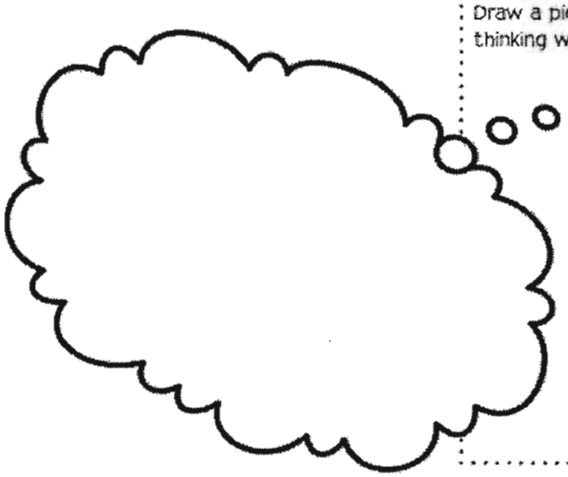


Superflex®
Homework Report



Draw a picture or write about a time this week that you called on Superflex® to defeat Unthinkables®

Draw a picture of what you think the Unthinkable was thinking while trying to defeat your Superflex.



How many times were you Superflex this week? Put a star in the box below each time.

Appendix S
Acquisition Target Behaviours Data

Table S1. Frequency data on prompted statements, by acquisition target codes.

		Acquisition target codes						
Phase	Session	1	2	3	4	5	6	Total
1	1	8	7	12	13	0	0	40
	2	10	1	1	9	0	0	21
2	3	9	0	0	9	8	0	26
	4	2	1	0	3	8	0	14
	5	5	3	0	3	5	12	28
	6	6	1	0	2	31	14	54
	7	0	1	0	1	20	6	28
3	8	0	0	0	0	15	11	26
	9	2	0	0	0	15	8	25
	10	4	1	3	0	8	18	34

Note:
Acquisition target codes – statements about: 1 = another person's perspective, 2 = subject's own perspective, 3 = situations / behaviours that are expected and unexpected, 4 = social thinking vocabulary terms, 5 = Superflex and the Team of Unthinkables, 6 = Superflex strategies

Table S2. Frequency data on spontaneous statements, by acquisition target codes.

		Acquisition target codes						
Phase	Session	1	2	3	4	5	6	Total
1	1	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0
2	3	0	0	0	0	6	0	6
	4	0	0	0	0	0	0	0
	5	0	0	0	0	2	1	3
	6	0	3	0	0	0	5	8
	7	0	0	0	0	5	0	5
3	8	0	0	0	0	4	7	11
	9	1	3	0	0	4	6	14
	10	1	3	0	2	3	3	12

Note:
Acquisition target codes – statements about: 1 = another person's perspective, 2 = subject's own perspective, 3 = situations / behaviours that are expected and unexpected, 4 = social thinking vocabulary terms, 5 = Superflex and the Team of Unthinkables, 6 = Superflex strategies

Appendix T
Generalization Target Behaviours Data

Table T1. Percentage of 15-second intervals data on generalization target behaviours, by expected behaviours and unexpected behaviours.

		Expected behaviours			Unexpected behaviours		
Phase	Session	Verbal	Nonverbal	Combined	Verbal	Nonverbal	Combined
B	1	16.19	10.56	24.64	25.35	14.08	32.39
	2	23.84	3.84	26.15	12.30	3.07	12.30
	3	8.03	6.25	14.28	31.25	25	48.21
1	4	15.50	4	19.5	15	13	24
	5	2.29	0	2.29	26.43	18.39	36.78
2	6	11.29	2.41	13.70	10.48	12.90	20.16
	7	20	2.14	22.14	7.85	7.14	14.28
	8	13.15	7.89	20.39	23.68	11.18	30.26
	9	12.14	5	16.42	23.57	14.28	32.14
	10	13.37	1.91	14.64	16.56	3.82	17.83
3	11	17.12	6.16	22.60	30.13	10.27	35.61
	12	12.21	2.29	12.97	16.79	4.58	19.08
	13	14.65	3.44	18.10	16.37	20.68	29.31
P	14	17.18	6.25	22.65	8.59	3.12	10.93
F	15	16.07	3.57	19.64	17.85	9.82	24.10

Appendix U
ABC Assessment Data

Table U1. Data obtained in the ABC assessment conducted on the third baseline session.

Time	Antecedent	Behaviour	Consequence
00:09	Investigator asked Steven and Sarah what they would like to play	Steven picked the game without asking Sarah (control, V.1)	Sarah wanted to play a different game, Steven just started to play Wii, she eventually gave in
01:17	Investigator asked Steven to find a two-person game so Sarah could play too	Steven did not respond (non-compliance, NV.4)	Investigator repeated request until Steven complied
02:10	Started to play Wii	Steven told Sarah what they were going to do (control, V.1)	Sarah agreed
02:22	Sarah not moving the controller correctly	Steven took her controller and did it (interrupting turn-taking, NV.2)	Sarah let Steven take her controller, waited until he gave it back
02:48	Steven asked Sarah if she remembered how to play the game, did not wait for her to respond	Steven started to read the game manual to her (control, V.1)	Sarah told Steven she knew how to play; she sat and listened to him, and started to get impatient
04:36	Steven read the game manual to Sarah and then started to play the game	Steven told Sarah how to play (control, V.1)	Sarah agreed; she did what Steven told her to do
04:47	Playing Wii	Steven told Sarah how to move the controller (control, V.1)	Sarah did what Steven told her to do
05:26	Playing Wii	Steven told Sarah how to play (control, V.1)	Sarah he did what Steven told her to do
06:14	Playing Wii	Steven told Sarah how to play (control, V.1)	Sarah did what Steven told her to do
06:28	Playing Wii	Steven told Sarah how to play (control, V.1)	Sarah did what Steven told her to do

06:39	Playing Wii	Steven told Sarah how to play (control, V.1)	Sarah did what Steven told her to do
07:28	Playing Wii	Steven told Sarah how to play (control, V.1)	Sarah did what Steven told her to do
07:46	Playing Wii	Steven told Sarah how to play (control, V.1)	Sarah did what Steven told her to do
08:09	Playing Wii	Steven told Sarah how to play (control, V.1)	Sarah did what Steven told her to do
08:23	Playing Wii	Steven told Sarah how to play (control, V.1)	Sarah did what Steven told her to do
08:46	Playing Wii, completed the stage of the game	Steven told Sarah he did all the work (rude, V.3)	Sarah looked sad, did not say anything
09:28	Investigator asked Steven to pick an easier level so Sarah would know how to play better	Steven did not respond (non-compliance, NV.4)	Investigator did not follow through with the request
10:26	Investigator told Sarah there was not enough time to play another game, Sarah asked again	Steven yelled at Sarah and mocked her facial expressions (yelling, V.4; rude facial expressions, NV.1)	Sarah told Steven she was upset, he ignored her
12:27	Steven asked Sarah to get him a plate and she got him the wrong one	Steven told Sarah she got the wrong plate, it has to be a different one (control, V.1)	Sarah got him the plate he wanted
14:44	Starting to play a new game, investigator was explaining the rules	Steven said he was not going to play (refusal, V.2)	The investigator prompted playing the game
14:49	Investigator was explaining the rules of the game	Steven ignored the investigator and started to play with other things (non-compliance, NV.4)	The investigator stopped and waited until Steven was listening
15:28	Investigator asked Steven to help Sarah set up the game	Steven ignored the investigator (non-compliance, NV.4)	Investigator repeated request until Steven complied

16:13	Setting up the game	Steven said he was not going to play and walked away (refusal, V.2; quitting, NV.7)	Investigator and Sarah asked Steven to come back, waited for him
00:13	Setting up the game	Steven continued to grab the game pieces after the instructor told him to stop (non-compliance, NV.4)	Investigator repeated request until Steven complied
00:57	Setting up the game	Steven insisted the dice be a specific colour (control, V.1)	Sarah wanted a different colour but eventually gave in
01:11	Steven putting together a lego piece, Sarah grabbing it from him	Steven snapped at Sarah (rude, V.3)	Sarah stopped and waited for Steven to give it to her
01:23	Sarah's turn to roll the dice	Steven held the dice, would not give it to Sarah (interrupting turn-taking, NV.2)	Sarah said please and kept grabbing it until he let go
02:51	Steven's turn to roll the dice	Steven did not like his roll, so he rolled the dice again (cheating, NV.3)	Investigator told Steven that he already rolled the dice
02:57	Investigator told Steven that he he had to keep his first roll	Steven continued to roll the dice (non-compliance, NV.4)	Investigator repeated request until Steven complied
03:17	Steven tried to take a different piece in the game	Investigator told him to take the right piece, Steven ignored and insisted on taking the piece he wanted (non-compliance, NV.4; control, V.1)	Investigator repeated request until Steven complied
04:20	Steven's turn to roll the dice	Steven did not like his roll, so he rolled the dice again (cheating, NV.3)	Investigator told Steven that he already rolled the dice
04:44	Investigator told Steven that he had to keep his first roll	Steven refused to cooperate, wanted to roll again (refusal, V.2)	Investigator told him this time he could use his second roll

06:46	Steven rolled and in the game was allowed to take a game piece from Sarah	Steven grabbed the piece roughly from her hand (aggression, NV.6)	Sarah was upset; Steven did not like the piece and gave it back to Sarah
08:47	Steven's turn to roll the dice	Steven did not like his roll, so he rolled the dice again (cheating, NV.3)	Sarah told Steven she was playing by the rules and asked why he was not
09:10	Steven's turn to roll the dice	Steven did not like his roll, so he rolled the dice again (cheating, NV.3)	Investigator told Steven that he already rolled the dice; Sarah told him to stop cheating
9:32	Investigator told Steven that he already rolled the dice; Sarah told him to stop cheating	Steven said that he was not going to play anymore and he walked away (refusal, V.2; quitting, NV.7)	Steven said that the game was too hard
10:04	Investigator suggested building things with the lego instead of playing the game	Steven took all of the lego pieces, Sarah did not have any (interrupting turn-taking, NV.2)	Sarah got very upset, started to cry
10:40	Steven put all of the pieces back in the middle	Steven then messed up the pieces and started being rough with them; told Sarah that he got all the pieces (destruction, NV.5; control, V.1)	Sarah continued to get upset, told Steven to stop being mean
11:15	Started to play nicely with Sarah, she told him she wanted to build a kitty	Steven refused to participate and walked away (refusal, V.2; quitting, NV.7)	Investigator told Steven to come back and that he could build something else
11:21	Investigator told Steven to come back and that he could build something else	Steven ignored investigator and then refused (non-compliance, NV.4; refusal, V.2)	Investigator ended the session

Table U2. Data obtained in the ABC assessment conducted on the second probe session.

Time	Antecedent	Behaviour	Consequence
00:24	Setting up the game; Sarah stated that she wanted to go first	Steven said no, that he wanted to go first (refusal, V.2)	Sarah stated that she picked the game and she said it first
00:30	Steven wanted to go first, Sarah stated that she picked the game and she wanted to go first	Steven said that if he could not go first then he would not play (refusal, V.2)	Sarah said fine, that he could go first
04:43	Steven did not know what the card meant, had to ask the investigator	Steven grunted because he did not know what to do, had to pick another card (grunting, V.4)	Steven continued playing, just picked another card
06:27	Sarah thought Steven was looking at her card, she told him not to look	Steven yelled that he was not looking at her card (yelling, V.4)	Sarah ignored him yelling and continued playing the game
06:39	Sarah told Steven to flip over the timer when she starts to draw	Steven starts counting down and flips it before she is ready, insists that it go this way (control, V.1)	Sarah yelled at Steven to play fair
06:48	Sarah yelled at Steven to play fair	Steven yelled at Sarah, grabbed at her, said he would not play anymore (yelling, V.4; aggression, NV.6; refusal, V.2)	Sarah told him how to play fair and gave him back the timer, started playing again
07:31	Sarah was drawing and Steven was guessing what she was drawing	Steven was not getting it right, started to yell his guesses and at Sarah (yelling, V.4)	Sarah kept telling him he was wrong, she kept drawing
08:13	Sarah said it was her turn, but realized she was wrong, corrected herself	Steven said something rude about Sarah (rude, V.3)	Sarah was upset, said she was going to tell on him
08:32	Steven picked a card and told Sarah that it was going to be an easy one, put the card away	Sarah said Steven was cheating, Steven yelled at her that he was not cheating (yelling, V.4)	Sarah apologized

10:24	Sarah forgot to put the cardboard under the paper when she was drawing, Steven reminded her	Steven said something rude about Sarah (rude, V.3)	Sarah was upset, then continued playing the game
11:26	Steven was guessing at what Sarah was drawing and getting it wrong, the clock was running out	Steven started to bang on the timer (destruction, NV.5)	Sarah told Steven to stop
11:45	Steven rolled the dice, only got a one	Steven yelled, slammed the game pieces on the board (yelling, V.4; destruction, NV.5)	Steven continued playing
13:03	Sarah was guessing at what Steven was drawing and getting it wrong	Steven yelled "no" each time she guessed it wrong (yelling, V.4)	Sarah continued guessing
14:40	Steven was guessing at what Sarah was drawing and getting it wrong, she told him what it was	Steven grunted, said something rude about himself, and hit himself (grunting, V.4; rude, V.3; aggression, NV.6)	Steven continued playing, picked up the dice to roll
15:10	Sarah took the dice but it was still Steven's turn	Steven told her it was his turn and made a mocking face (rude facial expressions, NV.1)	Sarah apologized
15:23	Sarah said that she had to go to the washroom	Steven told her she had to hold it and keep playing (control, V.1)	Sarah continued playing
15:40	Sarah was guessing at what Steven was drawing and getting it wrong	Steven yelled "no" each time she guessed it wrong (yelling, V.4)	Sarah continued guessing
17:55	Sarah told Steven his guess was wrong, but he was very close to getting it right	Steven threw the timer (destruction, NV.5)	Sarah told Steven again that he was wrong
18:00	Sarah told Steven his guess was wrong, Steven threw the timer	Steven said he quit and left the room (refusal, V.2; quitting, NV.7)	Sarah told Steven to stop,

18:18	Steven would not come back, Sarah said that meant she won the game	Steven came back and pushed Sarah into the fireplace and punched her in the head (aggression, NV.6)	Investigator intervened, told Steven to get off of Sarah
18:40	Investigator intervened, told Steven to get off of Sarah and to play nicely	Steven left the room while the investigator was talking (quitting, NV.7)	Steven said he was telling on Sarah
18:45	Investigator told Steven that if he was not going to play nicely that he had to clean up	Steven ignored the investigator and yelled at Sarah (non-compliance, NV.4; yelling, V.4)	Investigator repeated the request multiple times
19:16	Steven and Sarah both yelling outside for their father to come in	Steven pushed and hit Sarah (aggression, NV.6)	Investigator intervened, father came inside
19:38	Steven and Sarah were telling on each other to their father	Steven yelled at Sarah, he threatened to hit her (yelling, V.4; aggression, NV.6)	Father asked questions about what happened and told them to play nicely
20:00	Investigator and father told Steven and Sarah to stop touching each other	Steven ignored his father and the investigator, continued to hit and push Sarah (non-compliance, NV.4; aggression, NV.6)	Father repeated the request and asked more questions about what happened
20:25	Sarah told their father he pushed her because she won, their father told him to stop being physical	Steven ignored his father, continued to hit and push Sarah (non-compliance, NV.4; aggression, NV.6)	Investigator intervened, told Steven to get off of Sarah
20:38	Sarah sat on Steven	Steven hit and pushed Sarah (aggression, NV.6)	Investigator told them it was time to clean up if they were going to fight
20:46	Investigator told Steven and Sarah that they both lost	Steven said he wanted to try playing the same game (control. V.1)	Sarah asked Steven why she should play with him because he had hurt her
21:00	Sarah asked Steven why she should play with him because he had hurt her	Steven continued to tell Sarah what to do (control, V.1)	Sarah sat there, did not say anything

Appendix V
Parent Reports Data

Table V1. Mother's responses to parent report form, question 1.

Phase	Week ending	(a) Describe a situation in which your son was inflexible in his thinking and behaviour in a social interaction.	(b) Did he use Superflex strategies when dealing with the situation?	(c) What did he say about his thoughts and feelings about the situation?	(d) How well did he handle the situation? (1 – 5*)
B	04/22/11	During evaluation, did not want to participate due to new Sponge Bob show	No	Nothing	2.5
	04/29/11	Asked to turn TV off, wanted sister to turn it off even though she did not watch it; walked away	No	Nothing	2
1	05/05/11	Continually tries to scare family members although receives very negative feedback from this; he feels it is funny, father gets mad and sister will cry when this happens	No	Apologized; felt bad and remorseful; although this action continues	2
	05/13/11	Went for a walk to park, he wandered off, went to sit on curb and would not walk with us	No; I used the "weird thoughts" terminology	Said his foot hurt him, this is why he acted as he did	2
2	05/20/11	Nana's birthday dinner lying down in booth and too much into Papa's personal space	No	He was tired	2
	05/27/11	Sister's birthday party wandering, talking back, non-compliant	No	Felt remorseful that he ruined her birthday	1
	06/03/11	Discussing sister's	No	I explained	2

		horseback riding, he put his hands over his ears and feels she shouldn't go anymore until he does		there are many things he gets to do without her so he should be happy for her; he agreed, felt bad about it	
	06/10/11	During a walk, when we didn't let him go into the water he chose to wander away from us and walk really far behind us	No	Nothing	2
	06/17/11	Father trying to teach him how to ride a bike, he got frustrated and mad at being unable to do it, hit bike and said he would never do it again	No	Was upset that day but five days later wanted to try again	2
3	06/24/11	Rock-paper-scissors to decide on restaurant for dinner, lost and got very upset	No	Felt he did nothing wrong	2
	07/08/11	Swimming at our friend's house, his sister and her friend play together, he feels left out and misbehaves by being angry, tattle-tailing on others, etc.	No	Explained to him the situation; he found it hard to understand	2
	07/26/11	When sleeping in hotel room he insisted on turning lights off when he was ready for sleep; got upset if his Nana and Papa wanted to read longer	No	Nothing	2

* 5 = Very effectively, 4 = Effectively, 3 = Satisfactorily, 2 = Ineffectively, 1 = Very ineffectively

Table V2. Mother's responses to parent report form, question 2.

Phase	Week ending	(a) Describe a situation in which your son was flexible in his thinking and behaviour in a social interaction.	(b) Did he use Superflex strategies when dealing with the situation?	(c) What did he say about his thoughts and feelings about the situation?	(d) How well did he handle the situation? (1 – 5*)
B	04/22/11	When grandparents arrived home with gifts he was patient while waiting to receive them	No	Nothing	3
	04/29/11	Power was out so had to change routine; had to find somewhere to eat dinner, was hungry but patient and flexible	No	Nothing	5
1	05/05/11	Let new friend choose games to play on the Wii; asked him questions about Japan	No	Wanted him to come back and play some more	5
	05/13/11	He had to come do errands with me; although I know he hates grocery shopping he helped me and was very compliant	No	Nothing	4
2	05/20/11	On the way home from Brock visit I took a detour to the flower shop; even though he prefers to go right home he was okay, actually happy to help me	No	Nothing	5
	05/27/11	While walking at Happy Ralph's sister needed a piggy-back ride due to her shoes hurting her; he wanted one too but when we showed him her bleeding heel he	No	Nothing	5

		understood it was only to help her and was okay with it			
	06/03/11	Had our first fire in fire-pit, got everyone marshmallows, helped people roast them	No	Nothing	4
	06/10/11	Went on a slide and shorts got very wet; stayed calm, walked over to me and told me what happened; continued to play at the park, it did not turn into a big issue	Yes, he chose to defeat Glassman	Appeared proud of himself to not get upset	5
	06/17/11	When choosing a toy after last week's session he asked to get one for sister as well so they can play together	No	Happy with himself	5
3	06/24/11	At Marineland waited patiently while sister did the rides; was very happy for her when she was finally tall enough for a new ride	No	Good day	5
	07/08/11	Went to visit a new person's house who has two kids; played really well with new child, following his lead	Unsure	He had a great time	5
	07/26/11	Wedding dinner, could have pizza with kids in separate room, explained uncle ordered him a nice dinner with the grown-ups; he stayed with the adults	No	Very proud of himself; loved the meal	5

* 5 = Very effectively, 4 = Effectively, 3 = Satisfactorily, 2 = Ineffectively, 1 = Very ineffectively

Table V3. Mother's responses to parent report form, questions 3 to 8.

		Question							
Phase	Week ending	3	4	5	6	7*	8	Total	Percent
B	04/22/11	1	3	2	2	2	2	12	40
	04/29/11	2	3	2	3	2	2	14	46.66
1	05/05/11	2	3	2	3	2	2	14	46.66
	05/13/11	4	4	3	3	2	3	19	63.33
2	05/20/11	3	3	3	3	2	3	17	56.66
	05/27/11	3	3	3	3	2	2.5	16.5	55
	06/03/11	2	3	3	3	2	2.5	15.5	51.66
	06/10/11	3	3	3	3	3	3	18	60
	06/17/11	4	4	3	3	3	3	20	66.66
3	06/24/11	3	3	3	3	3	3	18	60
	07/08/11	3.5	3.5	3.5	3.5	3.5	3.5	21	70
	07/26/11	3	4	4	4	3	4	22	73.33

* Reverse scored

Note:
Question 3: Does your son shift his behaviour to match the perspectives of others?
Question 4: Does your son behave flexibly while engaging in play activities with others?
Question 5: Does your son behave flexibly while engaging in conversations with others?
Question 6: Overall, is your son a flexible thinker?
Question 7: Overall, is your son rigid and stuck in his way of thinking?
Question 8: Overall, how effective is your son in thinking and behaving flexibly?

Questions 3 to 6: 5 = Always, 4 = Frequently, 3 = Occasionally, 2 = Seldom, 1 = Never
Question 7: 1 = Always, 2 = Frequently, 3 = Occasionally, 4 = Seldom, 5 = Never
Question 8: 5 = Very effectively, 4 = Effectively, 3 = Satisfactorily, 2 = Ineffectively, 1 = Very ineffectively

Total = sum of responses to questions 3 to 8: best score (always flexible) = 30; worst score (never flexible) = 6

Table V4. Mother's responses to significant upsets and inflexibility recording form.

		Type of behaviour reported					
Phase	Week ending	Insistence on his way of doing things	Rudeness, intruding personal space	Aggression towards others	Refusal or protesting	Quitting or leaving (includes threats)	Total
B	04/29/11	X	-	XX	X	-	4
1	05/05/11	XX	XXXX	X	XX	XX	11
	05/13/11	X	X	XX	XX	XXX	9
2	05/20/11	X	XXXX	X	-	X	7
	05/27/11	XX	X	XX	XX	XX	9
	06/03/11	-	X	XX	XX	-	5
	06/10/11	-	XX	XX	X	X	6
	06/17/11	XX	XX	X	X	-	6
3	06/24/11	XXX	X	-	XX	-	6
	07/08/11	XX	XXX	XXX	X	-	9
	07/26/11	XX	X	XX	XX	X	8
	Total	16	20	18	16	10	80

Appendix W
Interview Data

Participant Summary

Table W1. Participant interpretations of inflexibility and flexibility.

	Response	
Question	Pre-training interview	Post-training interview
Describe a recent situation in which you were inflexible when engaging in a social interaction. Probes: - What did you do to cope with the situation? - Were you able to tell your sister about your thoughts / feelings? - How did the situation make you feel? - How could you have handled the situation	- "Um" - "This morning" - "You should ask my sister" - "She just wanted to take my favourite spot" - "I know not to challenge or fight, so I just joined" - "I joined the fight" - "No" (when asked if was able to tell sister his thoughts / feelings) - "Just a little upset because she's little [mumbles]" - "I just said I'd be upset and walked away" - "It just made me feel bad for myself and just, makes me feel bad for my sister"	- "What does that mean?" - "Yeah" - "[pause] hmm [pause] well I know I've been inflexible, it's just I forget what was the time" - "This is tough" - "Inflexible [pause]" - "Hmmm, I don't have an example yet" - "[pause] inflexible" - "I still can't think of an example" - "[pause] I need to think of just one" - "No" - "I can't even think of one"

differently?	- "Well, I'm gonna be much better now, not stupid and just walked away. I'll just [mumbles] and tell her that, umm, you sit there and I'll just sit somewhere else"	- "[pause] [mumbles]" - "Well, I did make a promise with [Sarah], but then I didn't want to do the promise" - "[mumbles] we got into a little fight and then got over it" - "Just to play with [Sarah] … because it was just a little kid game, like for babies" - "Really upset" (when asked how his sister felt) - "I said 'fine'" - "[mumbles] keep my promise" - "I just said keep my promise, and do what I have to do"
Describe a recent situation in which you were flexible when engaging in a social interaction.	- "Well when I said we should go to Center Island, then we did" - "Well, they did what I wanted to do, because I could go to Centre Island with my family" - "They did!" (when asked if family wanted to go too)	- "[pause]" - "Uh [pause] this is a tough, tough, tough, tough [pause]" - "[pause] I can't do it" - "Umm [pause] I don't know" - "[pause]"
On a scale of 1-10, rate how flexible you are,	- "Can you repeat that?" - "Umm [points to scale]"	- "Well, I'll probably be a 5"

with 0 being very inflexible and 10 being very flexible.	- "I said I am a 5"

Table W2. Participant reflections on the training program (post-training interview).

Question	Response
How would you describe Superflex and the Team of Unthinkables to other kids?	- "[pause] humm [pause]" - "Superflex would be good" - "The Unthinkables are bad" - "I would tell that Superflex is the good guy and the Unthinkables is the bad guys" - "Mmmhmmm" - "[Superflex] defeats Unthinkables" - "That the Unthinkables like to make you be bad" - "Like they yell at the wrong times and they do bad things and they [pause]" - "I would tell them 'be Superflex, don't be an Unthinkable!'" - "Tell everybody that there is a team of Unthinkables inside your brain that will make you good or bad"
What advice can you give kids on how to defeat the Unthinkables?	- "[pause]" - "I'm trying to [pause] Superflex has a brain sensor" - "The brain sensor rings when there's trouble" - "[mumbles]" - "and, and, and Superflex [pause] helps [mumbles]"

	- "[mumbles] and Superflex helps him [pause] I can't remember" - "He brings the brain sensor over to the Unthinkable and they think about what they have to do [mumbles]" - "To defeat the Unthinkables, here's a list of how to defeat them" - "Just show what the Unthinkable does and how to defeat it"
Which Unthinkables did you have the most progress in defeating? How did you defeat those Unthinkables?	- "I think the one I defeated the most is Destroyer of Fun" - "By doing nice things, and doing what other people different want to do" - "Like when you do what they want to do and playing with them" - "[pause]" - "Hmm um no, I don't know. I didn't use any other strategies"
Did you find the vocabulary terms and strategies provided helpful when dealing with inflexibility?	- "What?" - "Mmm, a couple times" - "[pause] what times?" - "Every time" - "All the time"
What did you like about the time you spent at Brock?	- "Because it was cool, and I liked how it goes" - "With the thermometer … it was really cool and it showed the high and low" - "Doing the fun stuff and winning prizes"

What did you learn when you came to Brock?	- "That there's Unthinkables everywhere, not much people know about the Unthinkables"
What was the most important thing you learned? Why was that important?	- "About the Unthinkables" - "Like I loved hearing about what the Unthinkables could do to you" - "Because nobody ever knows that there is Unthinkables in your body" - "Because that way the earth could be a lot nicer"
What did you not like about the time you spent at Brock?	- "Just doing the work"
On a scale of 0-10, rate how effective the training program was in helping you be more flexible, with 0 being very ineffective and 10 being very effective.	- "It helped me a lot, kind of like half, it helped me pretty much a lot" - "Uh, probably in the half" - "Yeah, a 5"

Parent Summary

Table W3. Parent interpretations of inflexibility and flexibility.

	Response	
Question	Pre-training interview	Post-training interview
Does your son have difficulty with the following: / Over the past three months have you noticed a difference in your son's ability to: (a) show that he understands your point of view? (b) change his behaviour to meet the expectations of others? (c) show that he can be flexible in conversations with others? (d) show that he can be flexible in peer interactions?	- (a) "Umm, sometimes he does. Yes, he surprises me" - "Sometimes he will get so focused on something he won't let it go, but yeah, he's starting to get things like that now, which is really good" - "Because he won't go on about it" - (b) "No" - "There's no change in his set behaviour [laughs]" - (c) "Umm, I think it's coming a little bit, where, but I have to kind of put a lot of reminders for him. So when he has somebody over, I'll say, ya know, 'are you letting so and so play?' …" - "I don't think so, not as much as he, as he is when I do prompt and remind him. But his friends are so accepting of him and the way he is, that at this stage of the game they don't really care" - (d) "Yes, yes he can. He has learned that, umm, where ya know, people will come over and they'll be	- (a) "Yes" - "Yes, um, okay, I had an example, ill just try to think of it [pause]. Okay, so here's my example. So the day of the wedding that we went to in Jasper, um, the kids had the choice to either go upstairs to have pizza with all the kids, or to stay on the main floor and have a proper dinner with all the adults, and I know my stepbrother had ordered a proper dinner for them, and it was a very fancy kind of meal, so I knew it cost him a lot of money … he understood why and went with it" - (b) "Um, I guess the rafting might be a good example of that because, you know, we went white water rafting, and at first he was excited, and we were in the bus to go there, and he was getting nervous, and he said that he didn't want to do it, and he wasn't going to do it, he'll just wait, and I said 'no [Steven], everybody's here, everybody wants to do it, and you're going to have fun doing it, you'll have a good time' and he actually got past his nervousness, and tried it, and he loved it, so yeah"

	like 'let's go on the trampoline' and he'll 'oh, okay, lets go.' He does like to be first for everything, but he will do his turn" - "But for example, this is something, if [Steven] ever hurts himself with anything, that's like the end for everything. For example, they went out on the trampoline Tuesday night, and [Steven] bonked his head. That was it, he just stomped off and went inside the house and wouldn't talk to anybody." - "But when all the stars are aligned and he is in a good mood, and ya know, the weather is nice [laughs], yeah, he can be" - "It's gradually getting better, but yeah, there's still that issue, ya know. He still has that rigidity, where this is the way things should be and I don't like to stray from that"	- (c) "I find that to be very difficult for [Steven], because he still tends to go back to what he likes. Um, I think that its difficult for him to start talking about something else because he, maybe because he doesn't feel comfortable because he doesn't know a lot about something else, but I still find that he tends to go back to what he likes" - (d) "I do, I notice, I do notice an improvement. Absolutely, even that they play rock paper scissors all the time, and they used to fight about it all the time, and they're getting past it and they're having more fun" - "I just find him to be a little bit more mature in the last couple months, and I don't know if that's just something that's coming with age, or if it is, it's probably a contributing factor everything that he's learned with this, as well as um, I don't know, I'm not exactly sure, you know, it's hard to judge exactly if this was the reason for it, but I'm sure that it has something to do with it"
Describe a recent situation in which your son was inflexible when engaging in a social interaction. Probes:	- "Umm, yes so okay, so here's an example, and it goes down to the Wii and him and his sister are playing on the Wii, and if his sister, [pause] he plays it all the time and [Sarah] doesn't play it often so she's not very good at it. And he gets very upset about that, and he's very inflexible as to 'no, you have to do it this way. This is the way you have to do it. I want to do it for you' … and then she gets upset and yells at him	- "Hmm, well, we went to the beach last Friday, and at about 2:30, Long Point we went to, which is a two hour drive, two hours and fifteen minutes, after we've been there a couple of hours he was like 'okay, I want to go home' and I said no, we drove here two hours, we're going to have to stay, and he really didn't want to stay, but I had him cool off in the shade and just relax, and gave him something to eat, and talked to

- How did he cope with the situation?

- What did he say about his thoughts / feelings?

- How did the situation make you feel about him? About yourself as a parent?

- How do you think both you and he could have handled the situation differently?

- Has his ability to handle such situations improved? (post only)

and then it's a big yelling match and then that's him"

- "Because its always done this way, this is how it has to be done"

- "He yelled at her" (when asked how he coped)

- "Oh he'll stomp off and sulk a little bit"

- "He won't come out and say it, I'll have to dig for it. Yeah, I'll have to say ya know, 'what's the matter?' 'I'm angry' or umm, I'll have to tell him to apologize for his behaviour, and he'll do it"

- "I don't think, yeah, no no, um, I mean he's not like physically as far as hitting, but he'll hold her back"

- "Or, ya know, put his hand over their face, or block them from going up the stairs, with my daughter. I don't think he would do that with anybody else but her, just because he probably feels that he can with her"

- "They're gonna be, they're gonna fight, they're siblings, which is, because I've never had a brother or sister, I don't really know how much fighting is normal and how much of it shouldn't be happening. So, that's where I get confused, 'cause I'm like how much do I separate and get mad, yell, ya know. Umm, so yeah, I donno"

- "In the situation, I'm not sure. I'm not sure which him and explained to him, um, about it, and gradually but at first he was being inflexible with it where he wanted to go back to the car, and he kept taking off to go back to the car, but I gradually broke him down"

- "He just, you know what I find he's understanding more, he's trying to understand why, the reason being for it, not just 'I want to go and that's all I want and I won't here anything else.' I think it's just him starting to understand why, and going with it"

- "No, but I mean, we knew he had a really good time, they both had a really good time. We asked them if they wanted to come back again, absolutely, they both really wanted to go back, so you know that didn't deter him from wanting to go back" (when asked what did he say about his thoughts / feelings)

- "I think for him he acknowledged, he did the, he handled it quite well" (when asked if he could have handled the situation differently)

- "Yeah, even that bit of convincing, you know, really, compared to a year ago, mmm, it wouldn't have gone so well [laughs]"

- "Oh yeah, mmhmm" (when asked if his ability to handle such situations has improved)

- "I would think so, absolutely" (when prompted if the improvement has been in the past 3 months)

	way I should go. I just, sometimes I wonder do I interfere or do I just stay out of it and let them figure it out? But then I think well he has autism, can he figure it out? I don't know" - "It's very confusing to know what the best course of action is"	
Describe a recent situation in which your son was flexible when engaging in a social interaction. Probes: - How did he cope with the situation? - What did he say about his thoughts / feelings? - How do you think he feels when flexible? - What can he do to be more flexible in the future? - What has happened for him to be more flexible? (post only)	- "Last Sunday we went for a hike and he really did not want to go for a hike, but we were like 'okay, you have to go for a hike, we need to go outside, we need to get some fresh air' and ya know, he really didn't want to but he actually, he, he came, had a good time, and really enjoyed it … I don't know that might be an example of being a bit more flexible" - "Yes. He didn't fight as much as I thought he might" - "Yeah, I thought he'd put up more of a fuss about it, but he actually broke down and … [laughs]" - "Great, he had a great time" - "On the way there he said that he didn't want to go, 'I wanna go home and play on the Wii'" - "I think he's, he's much more pleasant to be around when he is able to be more flexible" - "I think maybe thinking about it from the other person's point of view" (when asked how he could be more flexible)	- "Probably when we flew out to Alberta, because we had to get up at 4 in the morning, catch a shuttle bus, get to the plane, sit on a plane for 4 hours, get the rental car, sit in a car for 4 more hours, go visit, yeah that was it. You know, there was a lot of stuff going on that day, a lot of boring stuff, but a lot of things, and it was tiring, it was tiring for an adult, never mind for them. Yeah, that yeah, I think he handled that really well" - "I don't know if he's just grown up and handling it better now, knowing that not everything is going to be exactly how he wants it to be, it's got to be on everybody's term when you're traveling as a group, it's everybody, I don't know" (when asked what has happened for him to be more flexible)

On a scale of 0-10, rate how flexible your son is, with 0 being very inflexible and 10 being very flexible.	- "I would say that he is probably around a 3, I'd say, personally" - "I think he thinks he is more flexible than he is" - "And honestly, it's all about him and his world, right"	- "I would probably classify him between a 7 and an 8, right in there"

Table W4. Parent reflections on the training program.

Pre-training interview	
Question	Response
Overall, what would you like [Steven] to get out of being in this training program with us? What would you like to see happen?	- "I would like to see him, be a little, better with his social interactions. With having a conversation with a peer. I would really like to see that improve" - "Whether it's doing what the other person wants to do, and completing it [pause] instead of going off on his own and doing what he wants to do" - "To have a conversation, to go back and forth a little bit, because it tends to be one sided with him"
Post-training interview	
Question	Response
On a scale of 0-10, rate your son's ability to generate answers on the homework tasks, without prompting.	- "He's not good at that, he really isn't good at remembering back to behaviours and things he's done, and uh, so it's probably close to a 0 on that point" - "Yes, absolutely, yeah" (when asked if there was a lot of prompting and working together)
Did you find the vocabulary terms and strategies provided helpful when dealing with his inflexibility? On a scale of 0-10, how often did you use those terms and strategies? How often did he use them?	- "Absolutely" - "More so on our end, because we'll remind him, and talk to him about Destroyer of Fun, or you know, Glassman or Rock Brain, and try to be Superflex, and it usually triggers something in him where he starts to change his behaviour a little bit" - "Probably a 5" (when asked how often she used the vocabulary and strategies)

	- "Not often, I would say like a 1, yeah" (when asked how often [Steven] uses them) - "Yeah, he doesn't use the words so much, [Sarah] does [laughs]"
What did you like about the training program?	- "I thought it was great. It was a lot of time that you spent with [Steven] and [Sarah], um, I thought it was great, it was a really good program. I think this would be great for groups, and I've found it very helpful for me too because using that kind of terminology really helps trigger [Steven] to remember things. Uh, he may not remember it all the time but at least if you can say 'oh [Steven], Destroyer of Fun' [laughs]"
What did you not like about being involved in this study?	- "I think it was just a lot of hours [laughs]" - "That's okay, you know it's worth it, right? Yeah, that's all. I mean really, you couldn't have done it without all these hours, so it's fine, it's good"
Do you have any advice you would give to parents of future participants?	- "Just try to use the terminology as much as you can, and reinforce, and um, follow the ideas that you're given because they're great ideas"
Do you have any other comments about your family's participation?	- "Well it was pretty interesting how much [Sarah] got out of everything without having participated in the training program, really, so she got quite a bit out of it as well"
On a scale of 0-10, rate how effective the training program was in helping your son be more flexible, with 0 being very ineffective and 10 being very effective.	- "I would say probably an 8, it's a good program, yeah"

Sibling Summary

Table W5. Sibling interpretations of inflexibility and flexibility.

	Response	
Question	Pre-training interview	Post-training interview
Describe a recent situation in which your brother was inflexible when engaging in a social interaction. Probes: - Were he able to tell you about his thoughts / feelings? - What did you say when this happened? - Has his ability to handle such situations improved?	N/A	- "Yesterday, um, he said he would promise me he would play a game with me, and that was Kitty Kitten. And how you play Kitty Kitten is you have two different teams, and you say the word and then the Kitten [mumbles]. But then this happened. We were doing the Kitty Kitten game, and then I said, '[Steven], you can't break your promise' because he said he didn't want to do it anymore. And I said 'okay, well' and that he was breaking his promise. So then I told him, '[Steven], you did a pinky promise, um a foot promise, um a spit promise' where you spit and do a handshake, and I forget the rest. But then he was all angry at me, and then he hurted me. When I was trying to make it up to him, I was trying to say 'okay, what do you want to play then?' so I didn't want him to be all upset because of the Kitty Kitten game. … And then, when he was hurting me, I told him, '[Steven], that hurt' and then we got into a fight but I forget the rest" - "Well when he was hurting me, he said 'I'm sorry that I hurted you, I don't like it when you are hurt'"

		- "I said, '[Steven], it's okay, but [Steven] that's alright, but you have to, um, be more, you know, nicer' like um, like if, if you see the pinecones, like if this is me, and this is [Steven], and he said to [Steven], '[Steven] maybe you should be a little bit nicer, when we play and stuff.' I didn't really say anything, so I am just saying what I think I should have said" - "Hmm, let me think about that, I have to think about the last few days. Hmm, let's see [pause]. Yeah, I think he improved, I think the only time we battled was yesterday"
Describe a recent situation in which you were flexible when engaging in a social interaction.	N/A	- "He was being nice?" - "We were playing something called The Onion" - "It sounds funny, huh? [Steven] has, from Super Mario Galaxy 2, and he got a little toy onion, on a rope, and it said 'Super Mario Galaxy 2' on it. He swung it around and I'm pretending, like I'm in love with the onion, because I actually like it, so I'm like trying to grab it, and trying to say 'onion, onion, onion' [mumbles], and then he said, and then he said, 'well I don't want to do it, I just wanted to do it to make it fun, to think it funny' and he said to hit your hand, your head really hard with your hand and you put it there and hit it in the face, so I hurted myself, but then I got over it. …" - "I made him feel happy, when he's happy, it makes

him flexible, it makes him play fair and stuff" (when asked how he was flexible in that situation)

- "I think a couple of days ago, we were playing Snakes and Ladders, and he wanted the first man, and I wanted the other man, and I was pretty upset, and I was like 'ohhh' and I was pretty upset. I forget if I won last time or him, but he actually thought it was pretty good but when I got a higher number than him he started to get all angry, and upset, and I said '[Steven], wait remember the first game when I got a short number and you got a short number and you won?' and he said 'yeah' and I also said 'and I got a high number and I lost?' and he said 'yeah' then I said 'well, maybe it will happen again' and it did"

Table W6. Sibling reflections on the training program (post-training interview).

Question	Response
Did you enjoy playing games with your brother every weekend?	- "Yeah" - "I think it was fun"
How did you feel when you and your brother were playing games and he got upset or was inflexible?	- "When he got upset I had to calm him down, because I tried to make him remember that he gets Pokémon cards because I don't and [mumbles]. He liked the Pokémon cards" - "But he mostly likes Pokémon cards. So, I tried to calm him down, like '[Steven], remember, you get the Pokémon cards, I don't get any Pokémon cards' and then, I try to calm him down. And I calm him down, and then when he's all calmed down, then I start to get a little bit angry, a little sad, because I don't get any Pokémon cards, and then he tried to calm me down and said '[Sarah], calm down' but like he's angry at me, and I calmed down really quick, and didn't get hurt, but sometimes he hurts me" - "Hmmm, I don't know" (when asked how come he hurts you) - "I actually don't know. When we fight we start hurting each other, the third time he started hurting me I couldn't breathe and we had to call the hospital" - "It makes me feel really, really upset because it keeps reminding me of the time that he made me not breathe. He was on a chair, and jumped and tucked himself, you know cannonballs? He cannonballed on me" (when asked how it makes he feel when he hurts her) - "Yep, so he hurted me, we were going to call the hospital because I had a babysitter, not mom and dad, it was my Nana. We were going to call the hospital, but I said 'Nana, don't call the hospital' and it was a like miracle, I was starting to breathe again"

Did you notice a change in your brother's behaviour over the duration of the study?	- "When we were on holidays in Jasper, he was actually being a bit nicer" - "Yep, because I didn't like playing tag and he said 'do you want to play tag?' and I don't want to argue, if I don't argue with him, he knew that and he gets all nice, so I decided not to argue with him all that weekend, so I didn't, and I knew he was acting good"
Did you learn anything about Superflex and the Team of Unthinkables just by being around your brother?	- "Superflex and the Unthinkables" - "Hmm, well, yes, I did learn about them" - "Well, when [Steven] and I came home from picking him up the last day, you know, the one time where I came, I um, went down the stairs, okay, why am I talking about that? I actually forgot, so I started going down the stairs, because he wanted me to go down the elevator, but I said, 'no [Steven], I am not going down the elevator' and then he said 'are you a scaredy cat?' and then I said 'well at least I went on the city bus' and then he got all upset. But when, when I come home he said 'okay [Sarah], [mumbles], [Sarah] was a Worrywall' and then I didn't really get it because I didn't like work with you, so I was like '[Steven], what do you do here, what do you do here, what do you do here?' So I thought I should do it my way, so when I was doing it my way, write in there was I thought, then he said '[Sarah], don't write anymore' and I said 'why?' because I had only written like a few letters. And then he said 'because you're not doing it right' and I said 'not doing it right? What do you mean not doing it right, any way is right' and then he said 'no' and then he decided to do it and then this happened, a lot of stuff happened" - "Um, [Steven] taught me about the Worrywall, um, he taught me about some of the stuff, like Worrywall, Superflex, you know those stuff, um, Unthinkable, um, Rock Brain. So he taught me about them, like okay blah blah does blah, and bee blee blah blee blee. So [pauses]" - "Um, Worrywall makes you worry, rock, um, I forget some names, so I forget what some of the names mean, like um, Destroyer of Fun, I think I know what that means, it means not making anybody have fun"
Did you want to say anything else about the past few months?	- "Um, I think it was pretty fun"

Appendix X
Interviews: Within Case Analysis

Participant Summary

Table X1. Participant interpretations of inflexibility and flexibility.

Level of analysis	Pre-training interview	Post-training interview
General findings	- Steven was able to identify a situation in which he was inflexible and discuss the situation with prompting - Steven had difficulty identifying a situation in which he was truly flexible; potentially he could not think of a situation where he was more flexible, or that he lacks of understanding of the term "flexible" - Steven indicated that on a scale of 0-10, his level of flexibility was a 5	- Steven had considerable difficulty identifying a situation in which he was inflexible, when did identify a situation, he had difficulty discussing it - Steven was unable to identify a situation in which he was flexible; potentially he could not think of a situation where he was flexible, or that he lacks of understanding of the term "flexible" or the ability to reflect on his behaviour - Steven acknowledged that the questions were tough - Steven indicated that on a scale of 0-10, his level of flexibility was a 5
Description of responses to questions	- Steven's responses were short - At times he mumbled - Steven often required repeated questioning from the investigator - For the most part he responded to the questions	- He frequently paused between the question and his response - Steven's responses were short - At times he mumbled - Often he required repeated questioning and probing

	appropriately and used examples when asked - When asked to identify a situation in which he was flexible, Steven's response was more reflective of an inflexible situation, thus not answering the actual question	from the investigator - A few of Steven's responses were characteristic of echolalia - Several of Steven's responses did not answer the actual question asked by the investigator
Key words, qualifiers, revelatory phrases	- Fight (2) - "It just made me feel bad for myself and just, makes me feel bad for my sister" - "Well, I'm gonna be much better now, not stupid…" - "Well when I said we should go to Center Island, then we did … they did what I wanted to do, because I could go to Center Island with my family"	- Inflexible (3) - Tough (5) - Fight (1) - Really (1) - "[pause] hmm [pause] well I know I've been inflexible, it's just I forget what was the time" - "[mumbles] we got into a little fight and then got over it" - "Keep my promise, and do what I have to do"
Areas of discussion: (a) People (b) Places (c) Things / objects (d) Happenings	- (a) Self, Sarah, family - (b) Home, Center Island - (c) Favourite spot to sit - (d) Fighting, walking away from the situation, going to Center Island with family	- (a) Self, Sarah - (b) N/A - (c) N/A - (d) Making a promise and then breaking it, fighting

Table X2. Participant reflections on the training program.

Level of analysis	Pre-training interview	Post-training interview
General findings	N/A	- Steven was able to talk about Superflex and the Team of Unthinkables, however for some of the questions his responses reflected uncertainty - Steven appeared to understand the main concepts of the training program and what the most important parts were, and he indicated that he defeated the Destroyer of Fun, however he was inconsistent in his response to whether he made use of the vocabulary terms and strategies taught - Steven indicated that on a scale of 0-10, the effectiveness of the training program in helping him be more flexible was a 5
Description of responses to questions	N/A	- He frequently paused between the question and his response, particularly the questions that required him to discuss the training material - Steven's responses were short - Often he required repeated questioning and probing from the investigator - For all nine questions Steven's responses were appropriate, he answered the actual questions asked

Key words, qualifiers, revelatory phrases	N/A	- Superflex (6) - The Unthinkables / the Team of Unthinkables (14) - Destroyer of Fun (1) - Defeat / defeats / defeated (5) - "The one I defeated the most is Destroyer of Fun. … By doing nice things, and doing what other people different want to do. … Like when you do what they want to do and playing with them" - "That there's Unthinkables everywhere, not much people know about the Unthinkables" - "Because that way the earth could be a lot nicer" - "It helped me a lot, kind of like half, it helped me pretty much a lot"
Areas of importance: (a) People (b) Places (c) Things / objects (d) Happenings	N/A	- (a) Self, Superflex, Unthinkables, everybody, other people - (b) The earth - (c) Brain sensor, the thermometer, prizes - (d) Yelling, doing bad things, being good or bad, doing nice things, doing what others want to do, learning about the Unthinkables

Parent Summary

Table X3. Parent interpretations of inflexibility and flexibility.

Level of analysis	Pre-training interview	Post-training interview
General findings	- Steven's mother reported that Steven has varying degrees of difficulty with understanding her perspective, changing his behaviour to meet the expectations of others, being flexible in conversations, and being flexible in peer interactions	- Steven's mother reported that she had noticed a difference in Steven's ability to be flexible in peer interactions, however he still had difficulty being flexible in conversations; and that she thinks he has become more mature in handling situations
	- She was able to identify and discuss a situation in which Steven was inflexible	- She was able to identify and discuss a situation in which Steven was inflexible
	- She was able to identify and discuss a situation in which Steven was flexible, however her response also reflected Steven being inflexible within the situation	- She was able to identify and discuss a situation in which Steven was flexible
	- She indicated that on a scale of 0-10, Steven's level of flexibility was a 3	- She indicated that on a scale of 0-10, Steven's level of flexibility was between 7 and 8
Description of responses to questions	- Some of Steven's mother's responses to the questions were long, however most were shorter in length	- Steven's mother's responses to the questions were long and detailed
	- Her responses to many of the questions and many of her examples did not answer the actual question asked by the investigator	- Her responses to many of the questions and many of her examples did not answer the actual question asked by the investigator
	- Her responses and the examples she provided were generalized, reflecting proclamations	- Her examples were specific to actual situations, but many of her responses were proclamations

Key words, qualifiers, revelatory phrases	- Rigidity (1) - Inflexible (1) - Flexible (3) - Fight / fighting (3) - Really (6) - Very (4) - "… but his friends are so accepting of him and the way he is, that at this stage of the game they don't really care" - "But when the stars are aligned and he is in a good mood, and ya know, the weather is nice [laughs], yeah, he can be [flexible in peer interactions]" - "He still has that rigidity, where this is the way things should be and I don't like to stray from that" - "I don't think, yeah, no no, um, I mean he's not physically as far as hitting, but he'll hold her back" - "… I don't think he would do that with anybody else but her, just because he probably feels that he can with her" - "… I just, sometimes I wonder do I interfere or do I just stay out of it and let them figure it out? But then I think well he has autism, can he figure it out?"	- Understand / understanding / understood (4) - Inflexible (1) - Fight (1) - Really (6) - Very (2) - Exactly (3) - Absolutely (3) - "I just find him to be a little bit more mature in the last couple of months, and I don't know if that's just something that's coming with age, or if it is, it's probably a contributing factor everything that he's learned with this, as well as um, I don't know, I'm not exactly sure, you know it's hard to judge exactly if this was the reason for it, but I'm sure that it has something to do with it" - "He just, you know what I find he's understanding more, he's trying to understand why, the reason being for it, not just 'I want to go and that's all I want and I won't here anything else.' I think it's just him starting to understand why, and going with it" - "I think for him he acknowledged, he did the, he handled it quite well" - "Yeah, even that bit of convincing, you know, really,

	- "I think he's, he's much more pleasant to be around when he is able to be more flexible" - "I think he thinks he is more flexible than he is" - "… it's all about him and his world"	compared to a year ago, mmm, it wouldn't have gone so well [laughs]" - "I don't know if he's just grown up and handling it better now, knowing that not everything is going to be exactly how he wants it to be, it's got to be on everybody's term when you're traveling as a group…"
Areas of importance: (a) People (b) Places (c) Things / objects (d) Happenings	- (a) Steven, self, somebody / people who come over, friends, Sarah, family - (b) Home, hike - (c) Trampoline, Wii - (d) Reminding Steven to be flexible in conversations with friends, Steven playing with friends, Steven hurting himself, Steven and Sarah playing on the Wii, Steven getting upset at Sarah and telling her how to play, Steven and Sarah yelling at each other, fighting, going on a family hike	- (a) Steven's uncle, Steven, self, family, Sarah - (b) Wedding in Jasper, white water rafting in Jasper, Long Point Beach, flying to Alberta - (c) Pizza, fancy meal - (d) Steven's uncle's Wedding, dinner at the wedding, white water rafting with family, playing rock paper scissors with Sarah, Steven and Sarah used to fight but now they are having more fun together, going to the beach with family and Steven wanting to leave early, flying to Alberta to visit family

Table X4. Parent reflections on the training program.

Level of analysis	Pre-training interview	Post-training interview
General findings	- Steven's mother reported that she would like Steven to become better with social interactions as a result of participating in the training program, particularly with respect to doing what other people want to do and have conversations with others that are not one-sided	- Steven's mother emphasized the importance of the terminology in the training program, and using the vocabulary terms and strategies to trigger changes in Steven's behaviour - She indicated that on a scale of 0-10, the effectiveness of the training program in helping Steven be more flexible was an 8
Description of responses to questions	- Steven's mother's response to the question was short and clear - She did not use examples, her responses were general statements	- For all seven questions Steven's mother's responses were appropriate, she answered the actual questions asked - Steven's mother's response to the questions were short and clear - She did not use examples, her responses were general statements
Key words, qualifiers, revelatory phrases	- Social interactions (1) - Conversation (2) - Really (1) - "I would like to see him, be a little, better with his social interactions …"	- Destroyer of Fun (2) - Glassman (1) - Rock Brain (1) - Superflex (1) - Trigger / triggers (2)

		- Really (5) - Very (1) - Absolutely (2) - "He's not good at that, he really isn't good at remembering back to behaviours and things he's done" - "…I thought it was great, it was a really good program…" - "… I've found it very helpful for me too because using that kind of terminology really helps trigger [Steven] to remember things. Uh, he may not remember it all the time but at least if you can say 'oh [Steven], Destroyer of Fun' [laughs]" - "Just try to use the terminology as much as you can, and reinforce, and um, follow the ideas that you're given because they're great ideas"
Areas of importance: (a) People (b) Places (c) Things / objects (d) Happenings	- (a) Steven, peer - (b) N/A - (c) N/A - (d) Having a conversation with a peer, doing what another person wants to do, Steven going on his own to do what he wants to do	- (a) Steven, self, Sarah - (b) N/A - (c) Homework tasks - (d) Working on the homework tasks, using the vocabulary terms and strategies in conversations with Steven, the training program

Sibling Summary

Table X5. Sibling interpretations of inflexibility and flexibility.

Level of analysis	Pre-training interview	Post-training interview
General findings	N/A	- Sarah was able to identify a situation in which Steven was inflexible and discuss the situation, however the situation she described reflected aggression more than inflexibility - Sarah had difficulty identifying a situation in which Steven was truly flexible; potentially she could not think of a situation where he was more flexible, or that she lacks of understanding of the term "flexible" - Sarah's responses and the examples she gave focused mostly around Steven hurting her and her being flexible to accommodate him when he was upset
Description of responses to questions	N/A	- Sarah's responses to the questions were long and detailed - Her responses to the questions and some of her examples did not answer the actual questions asked by the investigator
Key words, qualifiers, revelatory phrases	N/A	- Angry (2) - Upset (4) - Hurt / hurted / hurting (7)

		- Fight (1) - Battled (1) - Flexible (1) - Really (2) - Actually (1) - "Well when he was hurting me, he said 'I'm sorry that I hurted you, I don't like it when you are hurt'" - "… Yeah, I think he improved, I think the only time we battled was yesterday" - "I made him feel happy, when he's happy, it makes him flexible, it makes him play fair and stuff"
Areas of importance: (a) People (b) Places (c) Things / objects (d) Happenings	N/A	- (a) Self, Steven - (b) Home - (c) Kitty Kitten game, toy onion, Snakes and Ladders - (d) Playing games with Steven, Steven breaking a promise, fighting, Steven getting upset and angry, Steven hurting her

Table X6. Sibling reflections on the training program.

Level of analysis	Pre-training interview	Post-training interview
General findings	N/A	- Sarah reported that she found participating in the probes fun, and that Steven taught her about Superflex and the Unthinkables - Sarah's responses and the examples she gave focused mostly around Steven being inflexible and hurting her, and her being flexible to accommodate him and calm him down when he was upset
Description of responses to questions	N/A	- Sarah's responses to the questions were long and detailed - Her responses to the questions and some of her examples did not answer the actual questions asked by the investigator, or parts of her responses were off-topic while trying to explain her example
Key words, qualifiers, revelatory phrases	N/A	- Angry (2) - Upset (3) - Hurt / hurts / hurted / hurting (5) - Argue (3) - Fight (1) - Calm / calmed (7)

		- Superflex (2) - Unthinkables / Unthinkable (2) - Worrywall (4) - Rock Brain (1) - Destroyer of Fun (1) - Really (4) - Actually (3) - "… he's angry at me, and I calmed down really quick, and didn't get hurt, but sometimes he hurts me" - "It makes me feel really, really upset because it keeps reminding me of the time that he made me not breathe. He was on a chair and jumped and tucked himself, you know cannonballs? He cannonnballed on me" - "… I didn't like playing tag and he said 'do you want to play tag?' and I don't want to argue, if I don't argue with him, he knew that and he gets all nice, so I decided not to argue with him all that weekend, so I didn't, and I knew he was acting good"
Areas of importance: (a) People (b) Places	N/A	- (a) Self, Steven, Nana, Superflex, Unthinkables - (b) Home, Jasper, Brock, elevator - (c) Pokémon cards

(c) Things / objects (d) Happenings	- (d) Steven getting upset and angry, Steven hurting her, her not being able to breathe, her calming Steven down when he was upset, on holidays in Jasper, playing tag, going down the elevator at Brock, Steven telling her about the Unthinkables